Vol. XXVIII. Part 10.

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NATIONAL MUSEUM OF VICTORIA

The Journal of the Department of Agriculture of Victoria, Australia.

October, 1930.

PRINCIPAL CONTENTS

Standard Herd Test Records—Report for 1929-30

Diseases of Lambs

The Pollination of Fruit Trees

Intensive Poultry-Keeping

The Rutherglen Experiment Farm

Prune Drying

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THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE

VICTORIA, AUSTRALIA.

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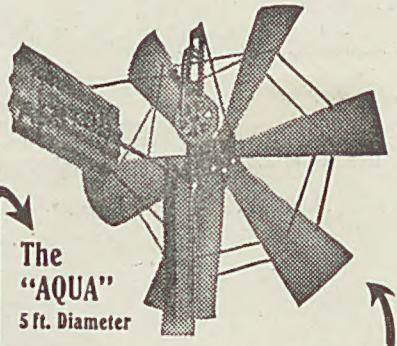

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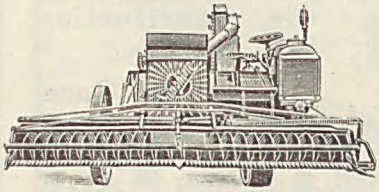

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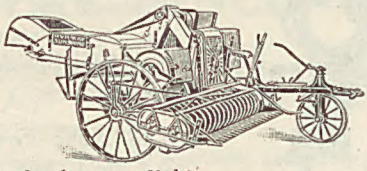

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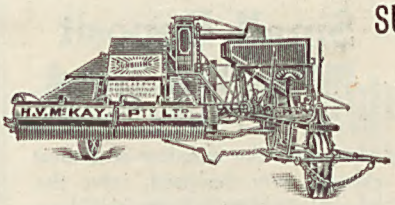

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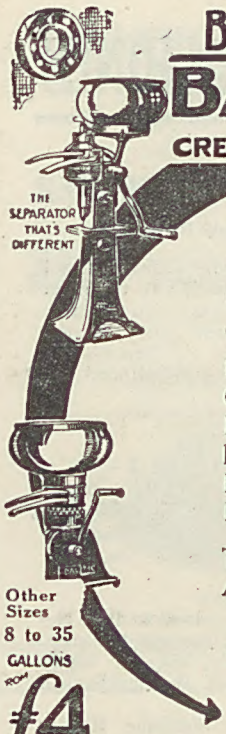

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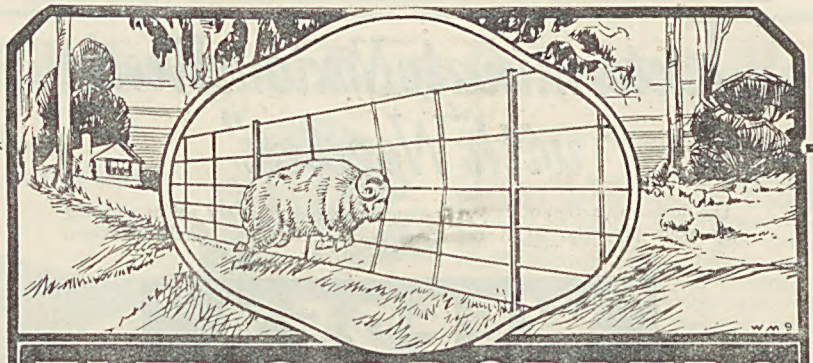

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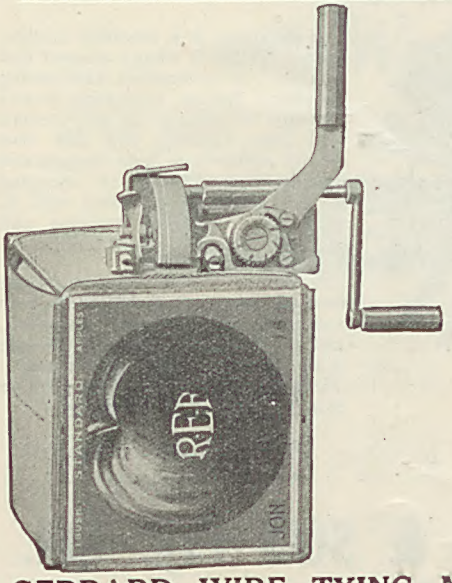

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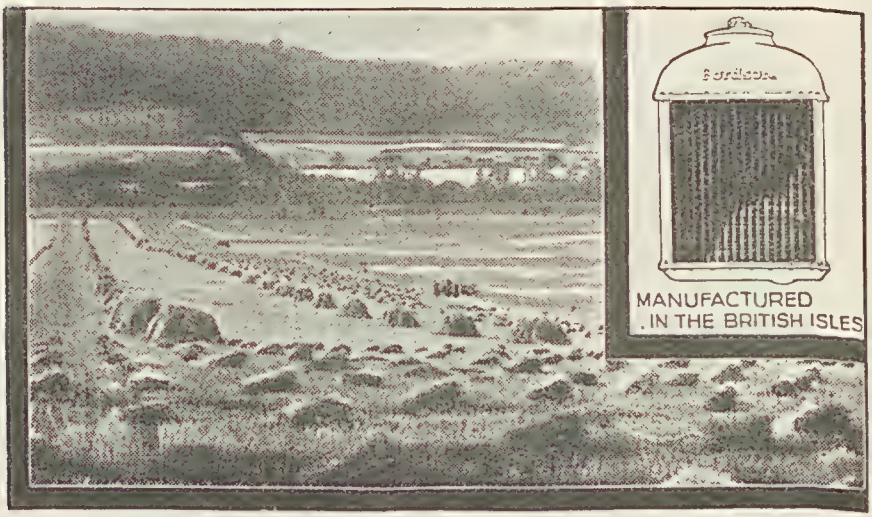

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THE JOURNAL

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Vol. XXVIII. October, 1930. Part 10

STANDARD HERD RECORDS.

REPORT FOR THE YEAR 1929-30.

By A. J. Gill, Senior Herd Tester.

The Beginning of Herd Testing.

To the dairying industry throughout the world the introduction of the modern methods of testing has meant the dawning of a new era. True, testing was carried out over 100 years ago, but the method followed then was slow and cumbersome. It was carried out by measuring the milk yielded by each cow, and then setting of a quart of it and churning the cream and weighing the butter obtained. Such a tedious process required a deal of patience. However, there were ever a few enthusiastic breeders who thought the work worth while, and went to great trouble to test their cows over a number of years, and to compile records of the results.

The following results are taken from an old copy of the *Complete Grazier*. They are those for a period of four years of a cow belonging to a Mr. W. Cramp, of Lewes, in Sussex. The records are set out in the following manner:—

Year.	Return.
1805—9421 qts. of milk, 541 lb. of butter ..	£41 5 11
1806—4137 qts. of milk, 450 lb. of butter ..	30 16 1

Unfortunately the manner by which the returns were determined is not stated.

The quantity of butter obtained from the samples of milk (each one quart) of six cows are stated; they are—

	Oz. dr.
No. 1	3 0
No. 2	1 6
No. 3	1 12
No. 4	1 10
No. 5	1 14
No. 6	1 6

These particulars indicate the trouble that was taken by some in those times to ascertain the worth of cows as milkers.

In the *Complete Grazier* there is also a reference to "cows in the Island of Jersey," and it is stated that 7 quarts of milk yielded by some of them has produced as much as 17 oz. of butter.

The recorder of the tests goes on to say, "The man who takes the pains to acquire good stock, and has the sense to keep them, lays the sure foundation for doing well." These farmers of 100 years ago were in many ways ahead of, and a good deal more progressive, than many of our farmers of the present time. Testing of to-day entails very little labour, and is suprisingly quickly performed when compared with the

Mr. O. J. Syme's Springfield No. 9.

(Born 23.9.19.)

(Leading Cow in Mature class.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1922–23	9,824	3·63	356·82
1923–24	12,331	3·95	487·11
1924–25	14,227	4·04	574·74
1926–27	15,652	3·82	598·33
1928–29	1,7435	3·47	605·06
1929–30	21,209	4·05	859·52

laborious methods of long ago. One would think that no farmer dependent on his dairy herd for a living would think of carrying on without testing the value of butter-fat produced by each cow. Still there are a large number who have not yet seen the wisdom of ascertaining the fat-producing capacity of their cows. They prefer to work, as it were, blindfolded.

Herd Testing in Victoria.

It is now over 30 years since testing was introduced into Victoria. Mr. Crowe, the present Superintendent of Exports, was at the time manager of a butter factory in the Western District, and was one of

Mr. O. J. Syme's Bolobek Trixy.

(Born 25.9.24.)

(Leading Cow in Senior 4-year-old class.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1927–28	14,642	3·73	545·45
1928–29	14,895	3·72	554·72
1929–30	18,219	4·04	736·07

Mr. J. Plattfuss's Greenvale Mona Keys.

(Born 1.5.26.)

(First in Junior 3-year-old class.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1928–29	14,342	3·11	455·84
1929–30	16,437	3·35	550·74

the first men to practise and advocate testing. Indeed, Mr. Crowe was the first person in Australia to use the Babcock tester. This was in August, 1892, and he immediately set about endeavouring to open the eyes of the farmer to the possibilities testing offered in building up profitable herds. Later Mr. Crowe, with Mr. Potts, also one of the pioneers of testing, visited country centres giving demonstrations and spreading the gospel of herd improvement.

While manager of a butter factory at Kongwak, in 1898, Mr. R. T. Archer (who later joined the Department of Agriculture) purchased a Lister-Babcock tester, and tested the herds of many farmers in the district. Later Mr. Archer managed a butter factory in the Warrnambool district, and while there he tested the Farnham Park herd of 100 cows, belonging to Dr. Grattan Wilson.

Mr. J. Watts's Kantara Trethella's Jenny.
(Born 21.7.27.)
(First in Junior 2-year-old class.)

Milk.	Test.	Butter-fat.
lb.		lb.
8,390	6·37	534·21

Just about the same time several other butter factory managers in the State commenced to test the cows of suppliers, and gradually breeders became interested.

It was in 1898 that Mr. W. P. Brisbane started to test his Ayrshire herd, and, with due regard to type and production, he built up the famous Gowrie Park herd. Mr. G. Chirnside, owner of the well-known Werribee Park Jersey herd, tested methodically, and some of our most famous Jersey sires have come from that herd, which was the result of years of careful selection.

A little later the Colac butter factory directors determined to start herd testing in that district; they engaged a lecturer from New Zealand, and for some years a splendid work was carried on. Other dairying

Mr. F. Austin's Duchess of Avalon.

(Born 9.1.25.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1926–27	5,658	5·61	317·47
1927–28	6,746	5·91	398·94
1928–29	9,995	5·41	540·70
1929–30	11,429	5·80	662·77

Mr. W. K. Atkinson's Fairy of Willow Park.

(Born 28.9.21.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1924–25	9,498	4·00	380·12
1925–26	13,225	3·99	527·52
1926–27	13,894	4·11	570·46
1927–28	15,084	4·28	645·81
1928–29	19,199	3·81	731·97
1929–30	18,204	3·91	711·68

companies, too, offered testing facilities to suppliers. Testing was also undertaken by several farmers, and, though some interest was aroused, it did not increase as was hoped.

Though there were a number of people testing their cows, the majority of them were still running mongrel bulls in their herds, and these, even when selected from the best cows, failed to bring about any great increase in butter-fat yields. One thing was clear: permanent improvement could be effected only by the introduction of good pure-bred sires, the progeny of pure-bred stock. It was very apparent that, before the yields of the general herds could be increased, improvement would first have to be made in the pure-bred herds.

Mr. W. K. Atkinson's Cherry of Willow Park.

(Born 27.10.18.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1921–22	8,733	3·72	324·67
1922–23	12,017	3·94	474·06
1923–24	15,880	4·00	635·92
1924–25	15,036	3·97	596·81
1925–26	16,245	3·83	622·69
1926–27	18,076	3·80	686·34
1927–28	16,245	3·88	629·94
1929–30	17,776	4·15	737·46

Mr. (now Dr.) W. A. N. Robertson discussed with Mr. Archer, Chief Dairy Inspector, the question of herd improvement. As a result of their discussion, plans were laid for the inauguration of the Government Standard Herd test. This was without doubt the great outstanding feature in the history of the dairying industry in Victoria. The scheme was carefully thought out, and up to that time was probably the best ever introduced in any part of the world.

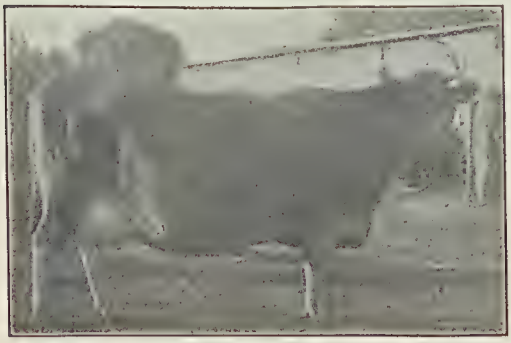
The first breeder to enter his herd was Mr. F. J. Stansmore, but the first samples were taken at the farm of Mr. Gordon Lyon, at Heidelberg; this was on the 3rd July, 1912. Both these breeders were very enthusiastic supporters of the scheme, and gave it whatever help

they could. Mr. Lyon's famous Banyule herd is still under test, and bulls from it have done much to improve the yield of many herds throughout the State.

Mr. J. Plattfuss's Westmere Oakwood Duchess.

(Born 10.11.19.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1922–23	10,319	3·41	351·95
1923–24	9,340	3·42	318·98
1924–25	19,017	3·37	638·43
1925–26	19,429	3·62	702·97
1926–27	21,750	3·76	817·28
1929–30	18,891	3·63	686·54



Mr. F. P. Stephens's Swansea Keepsake Treasure.

(Born 25.9.26.)

(Winner in Senior 2-year-old class.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1929–30	7,050	6·76	476·77
1929–30	8,822	6·52	575·57

Mr. J. D. Read and Mr. W. Woodmason were also among those who early joined the test. The herds of these two breeders are still being tested, and stock from the two of them has also done much to raise the State's average production.

The Jersey breeders came into the test willingly and were anxious to have their stock tested. Mr. Brisbane, of Gowrie Park, entered his Ayrshire herd, and it gave a good account of itself. Unfortunately, however, the majority of the Ayrshire breeders did not welcome the scheme, and allowed a golden opportunity to slip by, and other breeds have profited by their shortsightedness.

Mr. Archer, who conducted the test through the first years, spared no effort to make it a success. With that unflagging zeal which was one of his characteristics he visited several of the foremost breeders of the State testing their cows, and endeavouring to arouse their interest. At first it was uphill work, but gradually enthusiasm begin to grow. It would

Mr. W. C. Cayley's Joy Queen of Riversdale.

(Born 29.4.22.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1925–26	9,585	4·32	413·98
1926–27	11,319	4·54	514·13
1929–30	13,214	4·57	603·43

be hard to say what Mr. Archer's efforts have been worth to this State. He was actively supported by Mr. B. A. Barr, who was a very keen student of feeding and breeding. The present results speak for those early pioneers of testing. Though Victoria is the smallest State in the continent it has a far larger number of cows under test than has any other State. Last year over 2,300 pure-bred cows were tested in the Standard Herd Test, and this year the number of herds is nearing 250.

A word of praise is due to the energetic staff of dairy supervisors, whose motto is "Increase production and keep on increasing." Every supervisor is an ardent advocate of testing, and many of them, besides collecting samples for the Standard Herd Test, have several units of Herd Testing Association operating in their districts.

The Standard Herd Test has enabled our breeders to segregate the heavy-producing families; members of these have been mated so as to intensify the milk-yielding trait, and the yields of the progeny of these matings have been carefully studied.

That we have herds equal to those of any part of the world is not too extravagant a claim. In the Standard Herd Test cows have produced 800 lb. butter-fat in a period of nine months, and the productive powers of individual cows to-day will be the average of herds in the future.

Of course, disappointments have been experienced. Some herds have reached a high standard and then their records have dropped away, the introduction of fresh blood having caused deterioration.

Mr. O. J. Syme's Bainfield Topsy 13th.

(Born 30.8.20.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1925–26	14,455	4·10	593·29
1926–27	16,072	3·88	624·11
1927–28	16,079	3·95	634·85
1928–29	14,997	3·39	508·23
1929–30	16,868	3·70	624·35

Production, Type, and Pedigree.

The three main points that a breeder must study are Production, Type, and Pedigree. Production he must have. His cows would be useless without it. Testing alone can detect the producing qualities. Type denotes the pureness of the breed, the correct build, and a freedom from blemishes. Pedigree is of great importance; it is the history of the animals' ancestors, and a study of it may reveal certain weak links and undesirable traits, some of which should be guarded against.

The farmer is always endeavouring to increase production, and having reached a high standard he is ever on the watch so that each year's record may not fall below that of the previous year. There is ever that

tendency in stock, maybe in the whole animal and vegetable kingdom, to deteriorate, and the breeder must ceaselessly use his knowledge and experience to combat that tendency.

Building up a Herd.

With grade and short-pedigreed animals we must expect a certain number of disappointments. The ultimate object of every farmer, however, should be a pure-bred herd. A dairyman's first step towards improvement should always be the purchase of a pure-bred bull; then an effort should be made to obtain one or two pure-bred heifers. With them a commencement may be made to build up a herd. As the progeny of these animals and their descendants increase,

Mr. J. Plattfuss's Greenvale Piebe Patch.

(Born 23.8.23.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1926–27	9,873	3·53	348·76
1926–27	10,158	3·46	351·92
1927–28	12,124	3·31	401·03
1928–29	18,735	3·07	575·29
1929–30	20,424	3·23	659·38

the grade cows may be gradually disposed of. Some of our successful breeders slowly, but surely, built up their valuable herds in this manner. One man with a grade herd, worth possibly about £150, started in this way, and in a few years had a herd worth approximately £2,000. Another man, beginning in a small way on the lines advised by the Department, quickly built up a good herd, and when he had been dairying for about ten years, calves from his herd were selling at from 40 to 100 guineas, while his neighbours—some of whom had been dairying for 40 years—were selling calves for 7s. 6d. to 10s. per head. These latter people had made no progress; they were going along in the same old rut, using a mongrel sire on an indifferent herd. There are many such farmers, unfortunately, who cannot grasp the meaning of testing, and the value of a pure-bred sire. Testing a mongrel or grade herd helps, but of itself it can effect no permanent improvement. A mongrel sire will quickly undo any good that

testing may do, for his progeny will probably be inferior to their dams. Only by the use of a good pure-bred sire can permanent improvement be effected.

The work of the Standard Test has been to point out these bulls to the farmers. The bull-subsidy scheme has made it possible for every farmer to obtain a sire from tested stock, and in the next few years we can look to see a substantial increase in our production. Dairying is the most valuable of our primary industries. Its value must continue to increase, and it is surely no extravagant hope that, in the very near future, the average production per cow will be double what it is now.

We are conscious that the Standard Herd Test is costing the State much expenditure, but we know that the money that has been spent will, in the future, return dividends in the way of increased production.

Messrs. Smith and Sons' Halecote Opera Girl.

(Born 8.8.22.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1925–26	12,484	3·27	408·28
1926–27	18,940	3·43	649·96
1927–28	22,351	3·41	761·64
1929–30	20,123	3·34	671·43

When speaking of the improvement being brought about by testing one should not fail to comment on the very valuable work of the testers. Coming in touch with breeders in all parts of the State, they are enabled to study different methods of feeding and breeding, and are able to give stock-owners the benefit of their experience. The results this year, as in former years, tell of their ability in this direction. Working quietly, but zealously, these men are doing an important work in assisting to lay the foundation of dairy herds of the future.

This year has seen a considerable increase in the herds under test, and the number would have been considerably higher but for the fact that, owing to shortage of staff, no new herds were accepted for several

months. However, it is hoped that during the ensuing year there will be no need to refuse would-be entrants, and that full use will be made of the Standard Herd Test to develop our leading industry.

Suggestions for Improvement of Dairy Herds.

In the year 1918 Mr. Archer, then Senior Dairy Inspector, submitted a memorandum making suggestions by which the dairy herds of the State could be improved. Those suggestions are as valuable to-day as when they were made, and I, therefore, take the liberty of reproducing them here. They are as follows:—

One of the greatest problems facing us at the present time is how to convince dairy farmers generally of the necessity for using bulls for

Messrs. Smith and Sons' Halecote Oakleaf Fobes.

(Born 1.7.20.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1922–23	8,415	3·55	298·52
1923–24	13,690	3·43	465·81
1924–25	20,199	3·18	642·10
1926–27	19,260	3·60	693·07
1927–28	15,512	3·77	584·56
1928–29	19,026	3·56	676·77
1929–30	17,555	3·64	639·18

Standard Herd Test cows—bulls that must improve the producing capacity of the dairy herds.

Four years ago [i.e., in 1914] a Herd Testing Association was formed at Colac. There are nearly 30,000 cows on 1,200 dairy farms in the district, but only 1,600 cows belonging to members were tested last year. The cost to the farmer was 2s. 9d. per cow.

Something is required to arouse interest in the question. It is of sufficient importance for the Government to take action, but in what direction? All those interested in the industry will remember what an impetus was given to the butter-factory system by Government bonus. Something of the kind might be applied to encourage testing of dairy cows; say, a bonus at the rate of £1 for every cow that produces 300 lb.

of butter-fat in nine months (conditionally upon her re-calving within 15 months), the testing to be done by local Herd Testing Association, Agricultural Society, or butter factory, subject to inspection or supervision of a Government officer. Every cow in a herd must be tested.

Mr. F. Trevaskis's Model of Ballara.

(Born 9.1.25.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1926–27	6,786	5·79	393·19
1927–28	8,153	5·50	448·28
1928–29	9,734	6·11	594·75
1929–30	10,211	6·06	618·99

Mr. N. H. Enders's Myra of the Wattles.

(Born 15.4.19.)

Season.	Milk. lb	Test.	Butter-fat. lb.
1927–28	12,398	4·77	591·73
1929–30	12,493	4·95	618·56

This should be the means of enormous improvement in feeding methods, as a cow will not produce 300 lb. of butter-fat unless she is well fed. We have sufficient proof in the results of the Standard Herd Test to show to what extent we may expect improvement, especially in Knight's herd, at Cobram, and that of J. D. Read, Springhurst.

If it cost the Government £50,000 a year, the money would be returned to the State many times over.

The conditions might include the use of pure-bred bulls from tested cows.

All breeders of pure dairy stock for sale to farmers should have them tested under the Standard Herd Test.

A reserve of fodder equal to 1 acre of grass per year should be provided.

All calves from cows giving 250 lb. of fat or over should be reared.

[At the time this memorandum was written certificates were awarded in cases where a cow yielded 250 lb. butter-fat or over; the standard to-day is 350 lb.]

Mr. J. D. Read's Tomato of Springhurst.

(Born 18.3.25.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1927–28	6,143	4·91	301·55
1928–29	10,359	5·15	533·47
1929–30	11,283	5·35	603·58

The Results of the 1929-30 Test.

The leading cow this year yielded over 800 lb. She is the third cow to pass the 800-lb. standard. A junior two-year-old has exceeded the 500-lb. mark. The average of the herds being tested is creeping up. Last year two of the leading herds were sold, which is a matter for great regret. It means, however, that several first-class animals have been distributed throughout other herds.

Leading cows in the various sections of last year's test were:—

	lb. butter-fat.
Mature Class—Springfield No. 9	859.52
Senior 4 Class—Bolobek Trixie	736.07
Junior 4 Class—Ipomea of Swansea	674.45
Senior 3 Class—Kingsvale Brunette 21st ..	536.49
Junior 3 Class—Greenvale Mona Keys ..	550.74
Senior 2 Class—Swansea Keepsake's Treasure..	575.57
Junior 2 Class—Trethella's Jenny	534.21

Special Herd Testing Prizes.

Champion Herd. Prize, £20.

Reserve Champion Herd. Prize, £10.

To be awarded to the herds giving the greatest and second greatest average under the herd-testing regulations of the Department of Agriculture during the year ending 30th June.

Minimum number of cows (completing the test during the year in a herd) ten.

Such herd to average not less than 300 lb. of butter-fat.

Handicaps to be allowed on the following scales. In a herd of more than ten, each cow shall receive an allowance equivalent to ½ lb. of butter-fat for each cow in the herd. Allowances according to class:—

Junior two-year old, 150 lb.; senior two-year-old, 125 lb.

Junior three-year-old, 100 lb.; senior three-year-old, 75 lb.

Junior four-year-old, 50 lb.; senior four-year-old, 25 lb.

Three best cows in winning herd to be exhibited at Royal Agricultural Show of that year.

The Champion Herd prize has been won by F. Austin's Jersey herd. The prize for Reserve Champion Herd goes to N. H. Ender's Jersey herd.

Grand Champion prize of £100 to be awarded to the cow securing the position of Annual Champion for three years, not necessarily in succession. Not yet won.

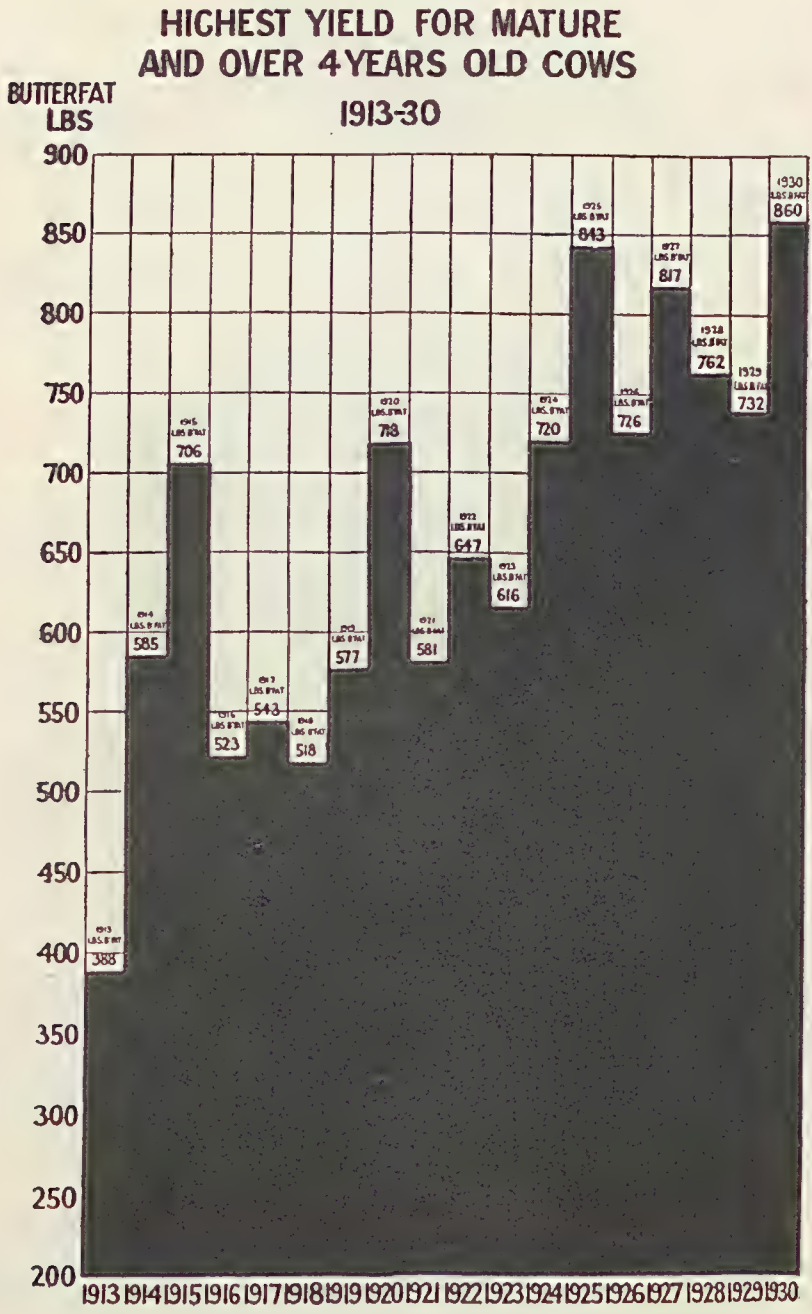
Annual Champion Cow under Herd Test regulations, prize of £10. To be awarded to the cow yielding the greatest amount of butter-fat during a lactation period terminating within the year ending on the 30th of June, under the Department of Agriculture's Standard Herd Test regulations and calving again within fifteen months from previous calving date. If two lactations are completed within the year the last will be considered. Cow to be exhibited at the Royal Agricultural Show of that year. Won by Mr. W. K. Atkinson's Milking Shorthorn cow, Cherry of Willow Park, 737.46 lb. of butter-fat.

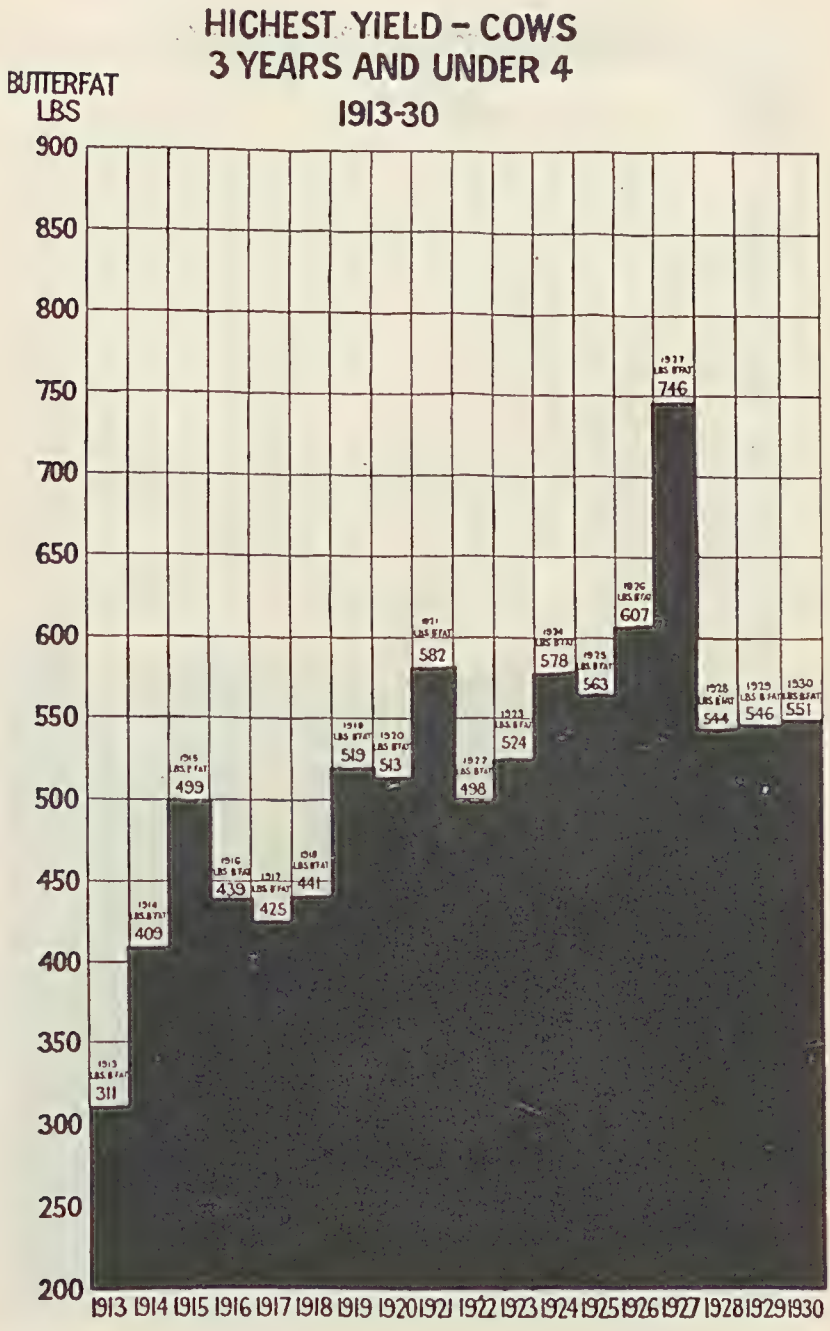
Annual Reserve Champion Cow, under Government Standard Herd Record regulations. For cow attaining second place, and calving again in fifteen months from previous calving date. Cow to be exhibited at Royal Agricultural Show of that year.

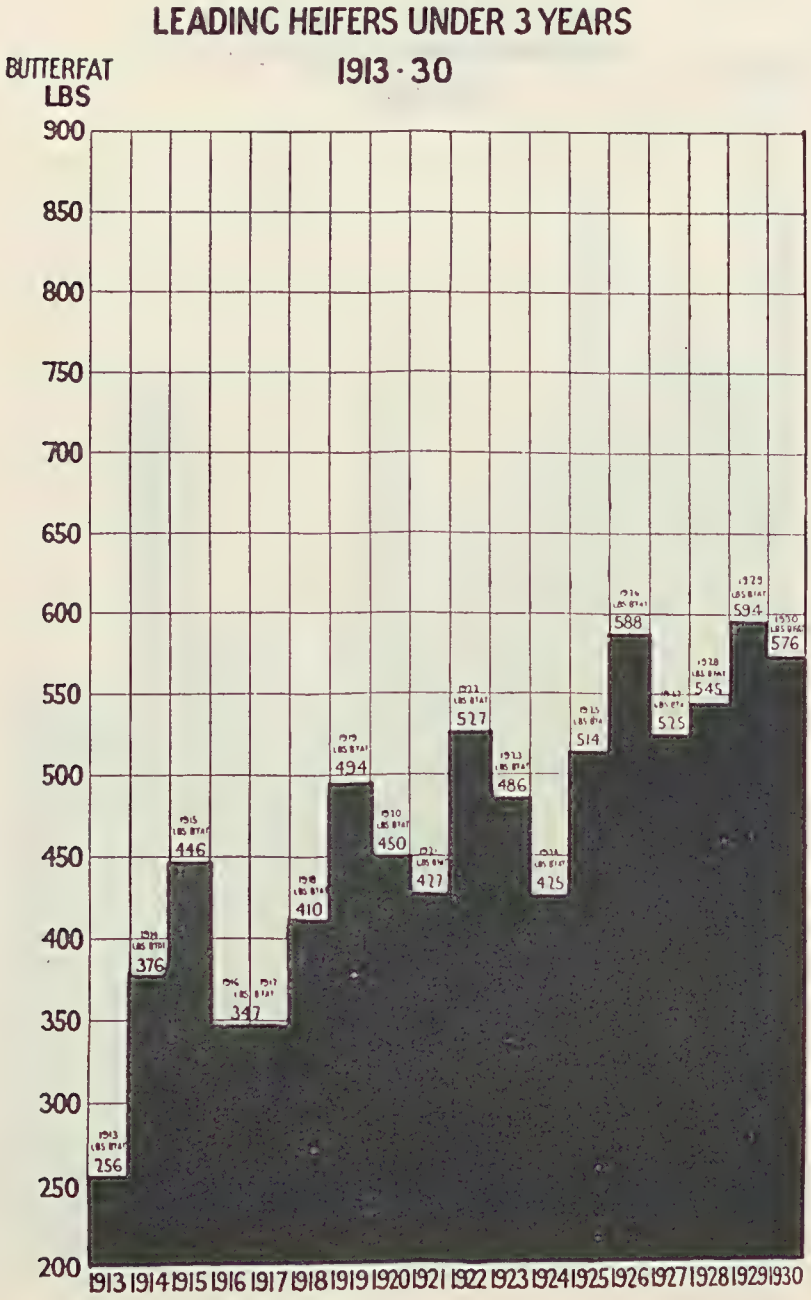
Won by Messrs. J. Plattfuss's Friesian cow, Westmere Oakwood-Duchess, 686.54 lb. of butter-fat.

List of Competitors.

A pamphlet has been issued containing the names in order of merit of all cows competing in the 1929-30 Standard Herd Test, together with the usual list of competing herds grouped alphabetically according to the several owners' names. Copies of the pamphlet may be had free on application to the Department.


HIGHEST YIELD FOR MATURE
AND OVER 4 YEARS OLD COWS
1913-30
BUTTERFAT
LBS
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
388
585
706
523
543
518
577
718
581
647
616
720
843
726
817
762
732
860
1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930


HIGHEST YIELD – COWS
3 YEARS AND UNDER 4
1913-30
BUTTERFAT
LBS
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
311
409
499
439
425
441
519
513
582
498
524
578
563
607
746
544
546
551
1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930


LEADING HEIFERS UNDER 3 YEARS
1913 · 30
BUTTERFAT LBS
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
256
376
446
347
410
494
450
427
527
486
425
514
588
525
545
594
576
1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930

New Herds for the 1930-31 Test.

The following new entries have been accepted for the 1930-31 test:—

New Entrants.

A. P. Bailey, Jersey, Yanathan
Chester Bros., Jersey, Kyabram.
Cockbill Bros., Ayrshire, Tongala.
Cockbill Bros., Ayrshire, Bacchus Marsh.
De Soyre Bros., Jersey, Kyabram.
H. C. Elburn, Ayrshire, Newlyn.
Elliot Farr, Jersey, Wimba.
T. J. Edwards, Jersey, Sale.
M. S. Gardner, Jersey, Nilma.
S. J. Herd, Jersey, Heidelberg.
J. M. Hopkins, Jersey, Yinnar.
R. E. Huggins, Jersey, Bullarook.
A. C. Head, Jersey, Seymour.
L. G. Hore, Milking Shorthorn, Leitchville.
A. B. Ingram, Milking Shorthorn, Powelltown.
L. W. Jackobi, Jersey, Catani.
A. Lade, Jersey, Alexandra.
K. C. Lawlor, Ayrshire, Caldermeade.
K. P. O'Brien, Jersey, Tennyson.
W. H. Pearce, Jersey, Eurack.
R. Stockdale, Jersey, Koonwarra.
T. H. Trigg, Jersey, Dennington.
J. Unthank, Jersey, Somerville.
Vaughan Bros., Jersey, Girgarre.
J. Wilmot, Jersey, Bullarook.

Mr. J. D. Read's Gladiolus of Springhurst.

(Born 8.4.21.)

Season.	Milk. lb.	Test.	Butter-fat. lb.
1923–24	5,987	5·70	341·35
1924–25	8,463	5·66	478·69
1925–26	9,732	5·57	541·59
1927–28	9,785	5·59	547·41
1928–29	8,370	5·30	443·21
1929–30	10,707	5·61	600·25

DISEASES OF LAMBS.

A Broadcast Talk by R. N. Johnstone, B.V.Sc., Senior Veterinary Officer.

One of my duties as Senior Veterinary Officer is to answer inquiries of a veterinary nature which reach the Department of Agriculture. Requests for diagnosis of cause of sickness or death which occur amongst stock, or the prescription of curative or preventive treatment, are given to me for reply. Some of the letters are extremely interesting, and many contain very useful and helpful observations from stock-owners, who are in absolutely the best position to make observations, because they are in daily contact with the stock, and in many instances know each individual animal, its temperament, its preference for particular foods, its habit of eating. They, therefore, are able to detect the first signs of sickness, and watch its development through the various stages.

Many of the letters, however, do not contain sufficient information on which to base a diagnosis that would be of any value. These, of course, vary from the classic, which read: "Chief V.O.—Dear sir, I had a cow die on me last week. Will you please tell me what she died of, and whether I am entitled to compensation," to the one which gives a very full and painstaking description of the conditions under which animals are kept, the number and incidence of deaths, the symptoms, if any, shown before death, but fail to give a description of the post-mortem appearance of the animal.

I want to make this appeal to all stock-owners. Take every opportunity to make yourselves familiar with the post-mortem appearance of every part of healthy animals, and if animals die on your farm, hold a very careful examination as soon after death as possible, make a note of everything that seems abnormal, and when you write asking for advice, give a full description of every departure from the normal. Do not hesitate to write and ask for advice. It is our job to help you, and we are anxious to do it.

Pulpy Kidney.

We receive much assistance from the Veterinary Research Institute, where Dr. Albiston is always ready and willing to give any help possible. Several letters of inquiry received recently give descriptions which correspond to pulpy kidney in lambs. This disease exists in most countries where fat lambs are raised, and it has been investigated in Australia, New Zealand, Great Britain, and America. The deaths occur at differing ages in different countries, but appear to coincide with the period at which the lamb receives the richest food. The fattest and best lambs die quite suddenly; usually they are found dead in the morning, and only very rarely is one noticed to be sick before death. The cause is considered to be over-nutrition. Within the last ten years the disease has increased considerably in Victoria; its increase appears to be co-incident with top-dressing of pastures and destruction of rabbits, which have improved the carrying capacity of the land, without a proportionate increase in the number of stock carried.

The disease was very fully investigated by Gill, of New Zealand. In New Zealand, deaths occur at from two to four weeks of age; in Victoria

at from three to six weeks old. In England, lambs are usually affected when they are from twelve to fifteen weeks old, at the time when they are given concentrates, such as bean meal, linseed cake, or cotton seed cake. The disease attacks lambs of all breeds; those that thrive best seem to be most liable to attack.

Under ordinary conditions, twin lambs rarely die of the disease, probably because they, as a rule, are not in such good condition as single lambs having a mother with a large supply of milk (and a free choice of succulent pasture to nibble). Occasionally lambs die of this disease on pasture which does not appear particularly rich, but on examination they are always found to be in a very forward condition.

Symptoms.

As a rule, the pasture on a property where deaths occur is not of a very bulky nature, but carries a fairly large proportion of low-growing rich clover.

In the vast majority of cases, no symptoms are noticed. Lambs may be seen apparently in excellent health, yet be found dead within a few hours. In a few cases observed by Gill, of New Zealand, the lamb lay stretched on its side; the expression was drawn, and suggested considerable pain, head stretched out, breathing rapid and jerky, pulse small and quick, heart sounds dull, and membranes of mouth and eye showing a blue tinge. At frequent intervals the animal gave a short bleat as though in extreme pain; the whole body quivered for a while, and then became quiet until the next spasm.

At post-mortem the kidneys are found to be reduced to a red jelly-like pulp, the central part being less affected, and sometimes quite firm. Both kidneys are affected in all cases. Sometimes the kidney appears mottled; this is due to haemorrhage in the organ. The liver is intensely congested with blood. The heart sac is distended to a variable degree with straw-coloured fluid. If the lamb has been dead some time, clots of fibrin will be present. On cutting into the heart itself, one finds slight haemorrhages under the lining membrane of the lower cavities.

Prevention.

In New Zealand, it has been noticed that lamb-marking appears to have a preventive effect. Prior to marking, the sexes are equally affected; after marking more ewe lambs die, therefore blood letting may be of some advantage. Compulsory exercise appears to have a beneficial effect, but is difficult to carry out effectively unless the lambs with their mothers are separated from the remainder of the flock at birth.

Overstocking or placing on poor quality pasture, or temporary starving by yarding for twelve or fourteen hours every fourth day, also appears to check the incidence of the disease. The condition of the ewe at lambing has some influence, because of the fact that mothers which are in strong, healthy condition have a full supply of milk, and rear their lambs much better.

Investigations carried out regarding this complaint have failed to reveal any organism which might be held to be responsible for the disease. Numerous attempts have been made, but, so far, all efforts to reproduce the disease have failed. Stewart, at the Cambridge

University, made a number of feeding experiments, using very rich concentrates, but the experimental sheep remained healthy. Further investigation is needed, and will be carried out as opportunity offers.

Many deaths amongst lambs which are attributed to this disease are actually due to other causes.

Blood Poisoning.

Cases of blood poisoning sometimes occur after marking. A leaflet setting out the precautions to be taken at marking time is obtainable free of charge from the Department of Agriculture.

Bloating.

Bloating is a danger which should be kept constantly in mind by the farmer where luscious feed, such as lucerne, or even young grass, or young crops of oats or wheat, are used for depasturing ewes and lambs. When stock are kept on these foods constantly, there is not much to be feared; it is when they are run on the crops for a brief spell, or when such foods are cut and fed to them that there is danger. The food is attractive and appetizing, and being unaccustomed to it, the lambs are apt to eat too greedily. This type of food ferments easily, and forms large quantities of gas in the rumen. The animals cease to feed, stand motionless, gather their feet under them, arch the back, and stop ruminating. Considerable swelling of the abdomen occurs. This is most marked in the left side, particularly before death. The abdomen walls become tense, and can be pressed in only with difficulty. Respiration becomes difficult. The membranes of the mouth become blue in colour, and finally the animal dies in convulsions. In acute cases the gases form so rapidly that suffocation may occur within a few hours.

Treatment.

In mild cases the forequarters of the animal should be elevated, and the flanks vigorously massaged; driving up a hill has much the same effect. If a large amount of gas has formed before the animal is noticed the rumen should be punctured through the left flank, and the gas allowed to escape.

Prevention.

Bloating is always due to careless feeding, and can be prevented with proper care and attention. Since clovers and lucerne, and young rapidly-growing crops or grasses are most dangerous, animals should be allowed to run on such pasture only after they have received some dry feed, or have fed on less luxuriant foods. They should never be left long in dangerous pasture, and should be kept moving whilst on it. If freshly cut green feed is being given, it should be supplied in smaller rations, and should be mixed with dry feed before being spread out for the sheep.

Arthritis.

Frequently in their letters, sheep men complain of lambs becoming lame and stiff in their joints. This stiffness may be due to one of several causes. Recently Dr. Albiston has received several lambs from the country, which showed acute arthritis in one or more joints of the

limbs. An organism has been isolated from the affected joints, but more investigation is necessary before any opinion can be offered as to the seriousness of the problem. Particulars of further cases of a similar nature will be welcomed.

Hadleigh Marsh, of Montana, United States of America, states that umbilical infection immediately after birth is responsible for many cases of arthritis in lambs. In some cases no losses occur during the first few weeks of life, but in lambs two to three months old, an arthritis develops, not causing the death of the lambs, but retarding their growth. These cases are considered to be due to umbilical infection, and the losses may be prevented by proper disinfection of the umbilicus immediately after birth.

Arthritis may also occur as the result of contamination of wounds caused during marking. Some cases are only temporary; others remain permanent. The lamb loses condition very rapidly, and frequently the owner destroys it. Treatment is very rarely successful. These losses may be prevented by the adoption of proper precautions during marking operations.

Parasites.

Sheep are very liable to attack by parasites, probably suffering more severely from this cause than do any other live stock. The damage from parasites is greatest as a rule amongst lambs and young sheep. The young tissues seem less resistant to and more intolerant of injury, and the more sensitive nervous system breaks down more quickly under parasitic invasion. The subject, however, is too large to deal with here, and it is hoped that an opportunity to discuss it fully may occur in the near future.

COMPARING HERD TEST YIELDS.

By W. J. Yuill, Senior Dairy Supervisor.

There is a fairly general suspicion in the minds of commercial herd-owners that the high records of pure-bred individual cows and herds would lose much of their glory if the cost of production were known. Earnest efforts have been made to try to find a basis from which a practical comparison may be made with production records of a commercial farm. This basis of comparison is sought mainly in order that high records may be understood at their true worth when one is purchasing herd sires or pure-bred female stock.

At the outset, it may be said that the question bristles with difficulties, because of the many factors which may operate to cause variation in production, and which must be considered when a comparison is being made. This is particularly so when records of "advanced register cows" are being compared with those of animals producing under normal commercial farm conditions.

A straight-out comparison may be valueless unless the following factors are taken into consideration: age, variation of feeding systems, length of time dry, and the time of subsequent calving, preparation for

test, length of test period, breed characteristics, and last, but not least, herd management. Any, or all of these may have a great influence on a production record. This being so, they should be considered when comparisons are being made.

Probably feeding, both prior to and during the actual lactation period, in addition to management, is of the most importance. On this question, an eminent authority in Professor Eccles, of the Minnesota Agricultural Experiment Station, says that as much as 70 per cent. more milk, and 65 per cent. more butter-fat, have been obtained from cows under forced conditions, compared with the records of the same cows when tested under normal farm conditions. He states, also, that the main factors for so great an increase were the preparation of the cows for test, the extra milkings, the longer time to the subsequent calving, and the special feeding conditions.

Every practical dairy-farmer knows that he could increase the production of his common or grade cows under similar conditions, and a common query heard is: "How much milk would these cows produce on my farm?" or "What did it cost to make that record?" and "What would the record be if the feeding was the same as my cows get?"

Any interested or sceptical dairy-farmer can definitely decide for himself what a fair comparison would be. This he can do by putting under test one of his best grade cows, and feeding her under similar conditions to those under which big records are established. The difference in the production of the cows in the two systems will give some indication of the amount to be allowed when a comparison between pure-bred and grade cows is being made..

The writer knows of commercial dairy-farmers who allow as much as 100 lb. of butter-fat to cover the supposed difference between the production on stud farms and that of normal commercial dairy herds. Therefore, when purchasing a new herd sire, they demand in his dam's average record at least 200 lb. of butter-fat more than the average production of their herd. They have realized that the bull's dam should be a superior producer, and allowance is also made for better feeding.

It is wise to make allowance for this, but it must not be forgotten that there is also a very great difference in the farm practices of the various owners of pure-bred stock; it is therefore impossible to make a set standard of allowance for such variations. Allowance must be made for the fact that a number of breeders of pure-bred cattle are carrying on their farming operations on purely commercial lines.

While it certainly is essential that the sire's dam should have been a high producer, it is far more important that she should have been a consistently good producer, and the more production there is indicated close up in the pedigree, the more valuable the pedigree will be.

On the Dominion Experimental Farm, Nova Scotia, an experiment in grading up from common cows with pedigreed sires has been proceeding for the past sixteen years. Writing on this experiment, Mr. S. A. Hilton states that when the sires used were backed up by official or semi-official records the daughters in the majority of cases were superior to their dams. He points out also that a pure-bred bull for herd improvement work is not dependent on the fact that he is a

pure-bred, but upon the milking propensities that he has inherited and is able to pass on to his progeny.

An instance is quoted of two pure-bred Ayrshire bulls, one with a plain pedigree, i.e., no available information concerning production, while the other had 30 production-record half-sisters and six daughters with high records. Under equal conditions the yields of the daughters of the latter bull were £20 a head better per annum than those of the daughters of the former bull.

When comparing records of production it must be remembered that it is not always sound practice to take the peak year figures, for it is quite possible for an ordinary cow to reach 500 lb. of butter-fat when all factors are in her favour; she may exceed the coveted 500 lb. standard in one lactation, but it may be that this amount will represent the production for a two-years' period.

It is necessary to give more attention to consistent production when comparing records, for sometimes it happens that a cow does well as a young cow, but poorly in latter years. Inquiry may show that change of ownership has taken place, and that the cow had gone into the hands of a better or worse owner, as the case may be. A cow that, as a two-year-old, or as a three-year-old, produced well may be debarred from doing so later on account of udder trouble, either due to accident or to mammitis, or to some other cause.

In this connexion a great deal of information is available from the annual reports of the Pure-Bred Herd Test work, in which appears a column showing the production for each year of test.

Reckoning a cow's value on her average production would seem to be the most rational means of comparison, but even here we must remember that part of her life may have been spent in indifferent hands, or in an area which would not be calculated to allow a cow to do herself justice.

Some authorities claim that there is as much as 50 per cent. difference in yields due entirely to climatic variations. Sometimes cows are transferred from river flats, or from districts where water for irrigation purposes is available when needed, to areas where prolonged dry conditions are experienced, or to steep hill country, or from a farm where good management and special treatment prevailed to one where mass conditions and harsh treatment obtain. Again it sometimes happens that a cow is transferred from the quiet of a small hand-milked herd to the bustle of a big shed where milking is done by machines; while another may be sold from a farm where she was being rationally fed, and was receiving sufficient concentrates for her production requirements, and pass into the hands of a dairy farmer whose cows are flat-rated.

These and many other factors should be considered when comparing records for consistent production. Interstate buyers must remember that a 365-days' record cannot be compared with a 273-days' record, nor should the record of a junior cow be compared with that of a mature one.

In conclusion, it should be pointed out that owners of commercial herds would do well to remember that the sons of known consistent pure-bred cows are mainly responsible for the development of this State's high producing grade herds.

THE POLLINATION OF FRUIT TREES.

By A. G. Strickland, M. Agr. Sc., Science Field Officer.

Cross-pollination has been recognized for many years as an important phase in orcharding. All experienced fruit-growers are aware that certain kinds and varieties of fruit will not yield satisfactorily unless inter-planted with other varieties, and whenever new plantings are being made the fullest consideration should be given to the selection of suitable varieties for such inter-planting. Modern fruit-growing tends to the planting of fewer varieties, and to the growing of one variety in a solid block. For the self-fruitful fruits (that is fruits which will set fruit if pollinated with their own pollen or pollen from another tree of the same variety) this practice does not reduce the maximum yields of fruit, but for fruits which require cross-pollination (as do most of our varieties of apples, pears, and plums), the practice of planting in solid blocks does result in reduced yields.

Pollination is the sexual process by which flowers produce seed, and as fruit, the grower's object, is usually accompanied by seed, it is a very important matter.

Broadly speaking, flowers are provided with male and female organs. The male organs are the stamens, and their function is to produce large numbers of tiny pollen grains. When these pollen grains are ripe, they are shed, and the stamens, having completed their function, die. In a flower which is perfect, or in other words has both male and female organs present, these stamens are grouped round the female organ or pistil. This female organ consists of a seed-case containing bodies which will later develop into seeds if pollinated, and a long stem projecting upwards and bearing a sticky bulb or stigma adapted to receive pollen grains from the stamens. All flowers do not have both seed-case and stamens present—for instance, the La Marguerite variety of strawberry carries flowers which have no stamens, and in order to obtain a crop from this variety it must be inter-planted with another stamen-bearing variety which can produce pollen.

When a pollen grain falls, or by agency of insects comes in contact with the sticky stigma of the female organ, the act is known as pollination. The pollen grain, having reached the stigma, now sends out a fine tube, which passes down the stem of the female apparatus and fertilizes the female germs in the seed-case, thus enabling them to ripen into fertile seeds. As soon as this occurs, swelling of the parts commences, and the blossom appears to have "set." If fertilization does not occur after the lapse of a certain period, the whole of the flower simply drops off the tree, and no fruits form. When a flower is fertilized by its own pollen, it is said to be self-fertilized; when it is fertilized by pollen from flowers of another tree of different variety, it is said to be cross-fertilized or cross-pollinated.

Fruit varieties may be broadly divided into two classes, viz., self-unfruitful and self-fruitful.

Self-unfruitful varieties will produce no fruit when fertilized by their own pollen or that of another tree of the same variety. Nearly all varieties of cherries are self-unfruitful, and it may also be said

that all varieties of apples, pears, and plums, even though not absolutely self-unfruitful, are benefited by having other varieties planted with them as pollenizers. Many of them are partially self-unfruitful, which means that under certain conditions a limited number of fruits will be set without cross-pollination, but for maximum yields inter-pollinators are necessary.

Self-fruitful varieties are able to produce mature fruit when pollinated by pollen of the same variety, or even without pollination at all. Citrus fruits may be quoted as an instance, also French and sugar plums.

The Williams Bon Chretien (or Bartlett) pear is generally regarded as self-fruitful. Nevertheless it will set more uniform crops over a period of years if inter-planted with another variety. In 1911, Mr. Pescott, of this Department, covered a Williams pear tree with insect-proof netting in order to test the tree's powers of self-fertilization. There were 558 flowers on this tree, and not a single fruit was set, demonstrating that under certain conditions the Williams pear may be absolutely self-unfruitful.

At the same time, four apple trees, two Jonathans and two London Pippins, were similarly enclosed. Though they all blossomed together profusely, only one fruit, a Jonathan, was set on the whole four trees. Adjoining unenclosed trees set heavy crops, thus indicating self-unfruitfulness of Jonathan and London Pippin. This experiment also stresses the importance of insects, particularly bees, for cross-fertilization.

Proper fertilization is dependent on, firstly, the presence of suitable varieties for inter-pollination, if the main variety is self-unfruitful.

Secondly, on the presence of insects, such as bees, to enable the distribution of pollen from flower to flower. It may be said in passing that wind is quite unimportant in distributing pollen from tree to tree. It has been stated by some authorities that 99 per cent. of all fertilized blooms owe their pollination to bees or other insects, and the remaining 1 per cent. to wind.

The question may be asked—"What are the essentials of a good pollenizer?" They are briefly as follow:—

1. The two varieties must bloom at the same time—an obvious necessity. The mistake is sometimes made of planting Rome Beauty and London Pippin with such a variety as Jonathan, which finishes blooming before the blossoms of the two former are even open.
2. The varieties must have an affinity for one another, i.e., the pollen of one must be acceptable to the pistils of the other. This affinity between varieties can only be determined by careful crossing experiments. At present, we have only American experience to follow, but it is hoped to commence such crossing experiments in this State during the coming season.
3. Both varieties must produce large quantities of pollen.
4. Varieties should come into bearing at about the same age.
5. Varieties should be good commercial ones.

Planting for Cross-pollination.

The blossoming periods of two varieties should overlap at least one week, as seasonal variations may cause slight fluctuations in the recorded blooming dates. Nevertheless the relative differences in blossoming periods of different varieties remain more or less constant. That is to say, if one variety is late or early in blooming in a particular season, other varieties will be late or early to a similar degree. In Bulletin No. 58 of the Department of Agriculture, the blossoming dates of various fruits in various districts are tabulated in detail, and from a study of these tables it is an easy matter to obtain varieties which bloom simultaneously.

There is a pitfall for the unwary, however; it does not always follow because two varieties of fruit blossom at the same time, or slightly overlap, that they are suitable for cross-pollination. They must also have an affinity for one another. It is known that some varieties of fruit trees are of no use for pollinating certain other varieties, the trouble being that the pollen of one will not fertilize the flower of the other. The task of determining between what varieties this inter-sterility exists is a long and arduous one, and at the present time is not far advanced. As facts come to hand on this phase of the problem they will be made known to growers.

Plums.

In America, a certain amount of information on inter-sterility has been accumulated. For example, it has been demonstrated that the Japanese types of plum do not pollinate with the European type. Most European varieties, however, will cross-pollinate one another effectively. Self-unfruitful plums which require inter-pollinators are Wickson, Grand Duke, Imperial, Robe de Sergeant, and many others. A list will be found in Bulletin 58. Climax, French, and other sugar varieties are self-fruitful, and do not require inter-planting with other varieties to secure satisfactory yields.

Pears.

Experiment has shown that pollen production by various pear varieties is always abundant. Williams pears will give better results if interplanted with another variety blooming at the same period. Commercial varieties which may be recommended for planting as pollenizers for Williams are Beurre Bosc, Beurre d'Anjou, Winter Nelis—the last-named being the most suitable. Keiffer pears are partially self-unfruitful, and should be inter-planted with Beurre Clairgeau or Howell. Most varieties will set better crops if inter-planted with other varieties.

Apples.

Under certain conditions, Jonathan will often produce heavy crops without the aid of a pollinator. However, it is always best to interplant in order to meet the possible contingency of self-unfruitfulness. On rich well-drained soil, Yates may be used as an inter-pollinator; on less fertile soil, use Delicious or Sturmer. Experience in the United Kingdom and United States shows that inter-sterility between different varieties of apples is by no means as common as in some other fruits, but certain varieties seem to be more efficient pollenizers than others. For example, Rokewood is reputed to be a very good pollenizer for Jonathan.

Most varieties of appples are partially self-unfruitful, and will yield better crops if inter-planted with other varieties blooming at the same time.

Stone Fruits.

Stone fruits seem to set more regular crops without cross-pollination than do apples, pears, and plums. Most varieties of peaches are self-fruitful, and do not require inter-planting with other varieties. In the United States of America, however, the variety of peach J. H. Hale has been shown to be completely self-unfruitful, and several of our own varieties of peach may possibly be partially self-unfruitful, and, therefore, would be benefited by inter-planting. Sour cherries are self-fruitful. On the other hand, experiment all over the world has shown sweet cherry varieties to be self-unfruitful. In the main, none of the sweet cherry varieties could be expected to set more than a few fruits unless there is provision for cross-pollination.

The Provision of Pollinators.

Having touched briefly on the theoretical side of inter-pollination I will now deal with some practical considerations. First of all, there is the question of providing pollinators. Since the highest yields are obtained from trees adjoining a good pollinator, and since a decrease in yield occurs in rows two trees distant, it is advisable to follow a system whereby no tree is more than two trees distant from the desired pollinator. Two solid rows and then either one or two rows of the pollinating variety should prove most satisfactory. If mixed planting is not objectionable, then every third tree in every third row would provide a nearby pollinator.

Where there is insufficient provision for inter-pollination in an already established orchard, pollinators may be grafted on limbs of trees at suitable intervals throughout the orchard. Every third tree in every third row should be topworked. Grafts should be inserted fairly high upon the limbs of old trees, as if inserted too low a large cut surface is exposed which may not heal satisfactorily. For a few years it is a good plan to pull fruit from the pollinator after setting, thus helping the development of a good limb and ensuring a plentiful supply of blossom every year.

Until the grafts have grown, small limbs of suitable pollinating trees, carrying plenty of blossom buds, may be distributed throughout the orchard, these limbs being held in large bottles or tins of water.

Bees as Pollinators.

I have stated previously that the common honey bee is the best pollenizing agent in the orchard. Under certain unfavorable weather conditions there may not be a sufficient number of bees in the orchard to ensure a full crop of fruit. Where such is the case, it is worth the grower's while making arrangements for the distrbution of colonies of bees throughout his orchard. It is generally considered that one colony to each acre of mature trees is advisable under such conditions. The addition of bees alone, however, will not turn an unprofitable orchard of one self-unfruitful variety into a profitable concern. Flowers of a pollinating variety must be also provided by means of dispersing blossoming branches of such variety through the orchard, and eventually by grafting inter-pollinators.

When fruit trees bloom profusely and yet fail to set full crops of fruit, the grower should immediately suspect lack of proper pollination, although this may not always be the cause of faulty setting. Factors other than lack of pollination which may cause failure are frosts injuring blooms, insects, such as thrips, killing blooms, improper manuring, &c. In a large percentage of cases, however, insufficient provision for pollination will be the cause. Ideal fruits from the standpoint of production are those which require no pollination whatever. The Navel orange and Zante currant grape are of this type.

It may be said in conclusion that, with the possible exception of sour cherries, quinces, some of the European plums, and a few peach varieties, provision must be made for proper cross-pollination when planting the orchard. Lack of attention to this matter will inevitably result in lower yields of fruit.

INTENSIVE POULTRY-KEEPING.

METHOD OF HOUSING.

By W. C. Rugg, Chief Poultry Expert.

The intensive system of keeping poultry for egg production has been in operation in Victoria for many years.

An indication of its success is the number of poultry-farmers who, commencing in a small way some years ago, now breed thousands of birds for egg production and keep them under intensive conditions. The majority of these have erected sheds varying in depth from 10 feet to 16 feet, with a height in front of 6 feet to 9 feet, and falling to 5 or 7 feet at the back. The sheds are divided with wire-netting partitions into compartments to hold such number of birds in each as is considered suitable.

Most farmers allow 4 square feet of floor space to each bird; thus the length of the building is governed by the number of birds to be housed. When large numbers are to be kept, it may be necessary to build several houses. If so, they must be spaced sufficiently far apart to allow the sun to shine into each row of pens during the morning. This helps to keep the scratching material dry and to purify the air. It will also keep vermin in check; it is in dark, badly-ventilated pens that these pests breed most freely.

A great improvement in the style of intensive poultry-houses is to be seen on several commercial farms where intensive poultry-keeping is carried on, as compared with the sheds of some years ago.

The shed most favoured to-day has what is known as a saw-tooth roof of somewhat similar construction to that used in many factory buildings. Each section of the saw-tooth is 9 feet deep, with a height to the roof in front of 10 feet, falling to 7 feet at the back.

This style of roof ensures perfect ventilation. In Victoria the house should face east or north-east; then on each sunny day sunlight will strike the floor through the 3-feet space at each section of the saw-tooth.

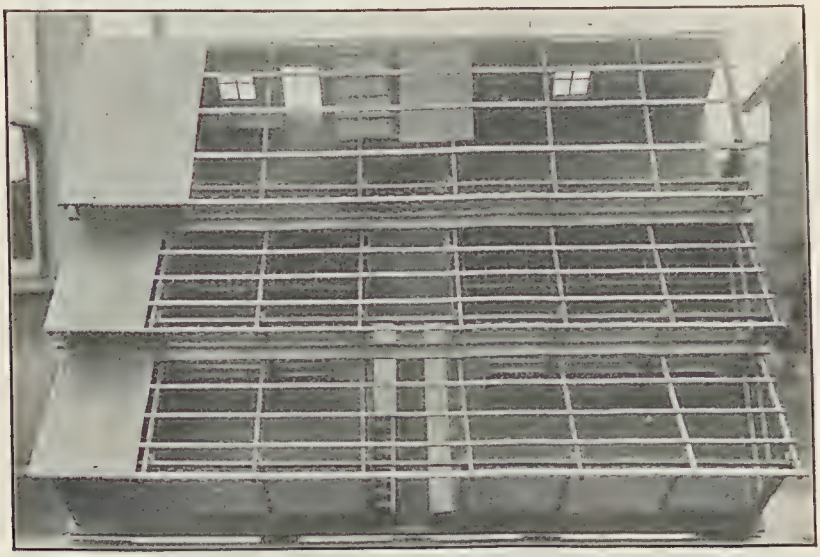
If the roof overhangs 2 ft. 6 in. or 3 feet in front of each section very little rain, if any, can beat in. Nearly all the sheds of this

type are divided into small pens of 9 feet by 6 feet, in which poultrymen keep twelve to fourteen birds.

The reason given by some for keeping birds in small numbers is that higher egg production is obtained than when larger pens are provided and a greater number of birds are kept together.

I admit that individual birds may lay more eggs if placed in a single pen than they would if running in a flock; but for egg production on a commercial farm, it is yet to be proved that birds of equal quality will lay more eggs when kept in lots of twelve than when housed in lots of 50 to 100, provided, of course, that ample hopper space or a feeding trough is made available to the birds.

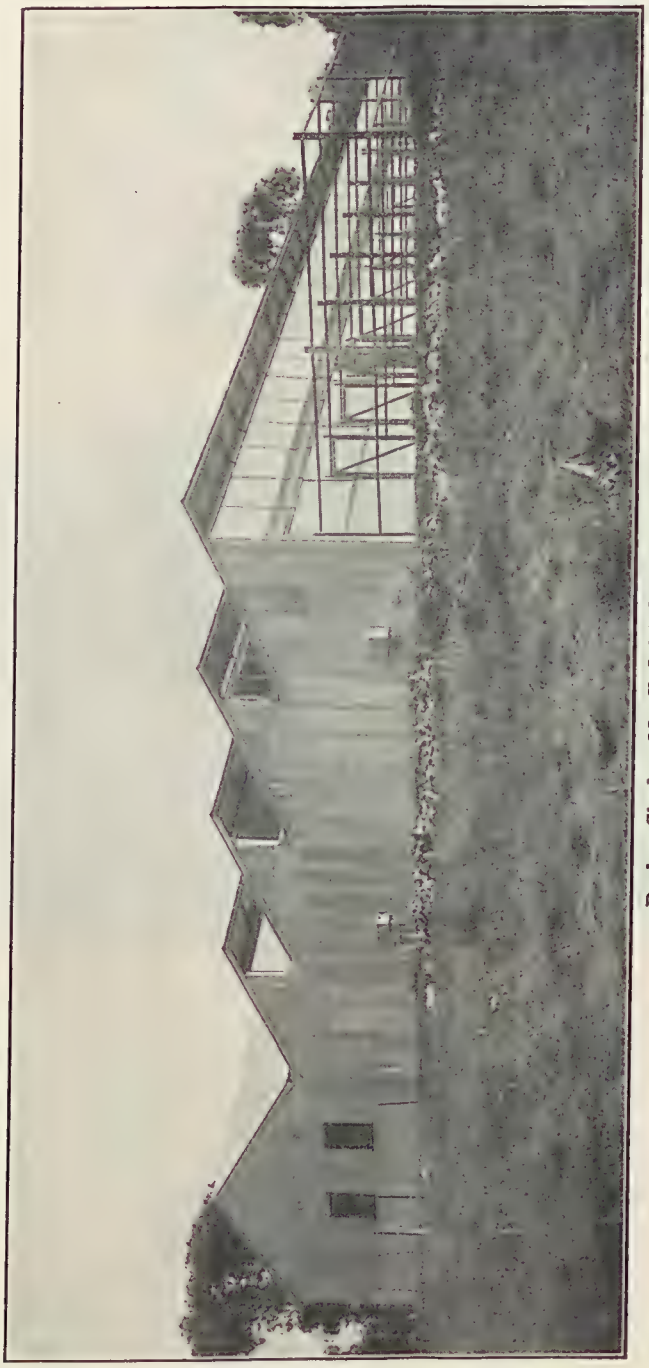
Owing to the present economic position, it is absolutely necessary to reduce the cost of producing eggs so as to enable us to meet the low prices now ruling.



Model of Buildings for Poultry-farmer.—Poultry-house, Feed-room, Egg-room, Garage, &c.

To erect sheds of the type spoken of above, and divide them into small pens capable of holding twelve to fourteen birds each, means that for every 1,000 layers kept from 70 to 80 pens will be required; this means that from 70 to 80 gates must be opened each time the birds are fed. By increasing the size of the pens to 18 feet by 18 feet only twelve pens would be required for each 1,000 layers. Apart from the consequent saving in material, it must be remembered that with the larger pens there would be a saving in time and labour which, where there is a large plant, would help considerably in cutting down the cost of production.

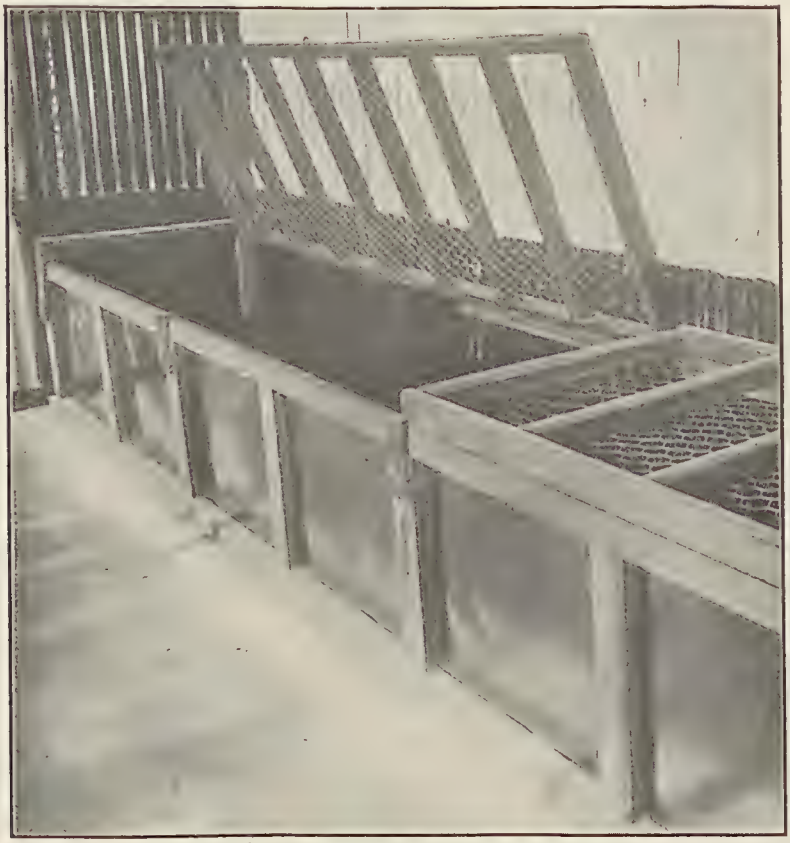
Above there is reproduced a photograph of a model of a set of buildings suitable for a poultry-farmer. This model was made by Mr. F. Zeven, foreman carpenter of the Department of Agriculture. Its scale is 1 foot to 1 inch. Provision is made for a feed-room, troughs, bins, &c., grain silo, egg-room, and garage or bulk store; there is also accommodation for 160 layers in two pens



Poultry Shed at Mr. F. J. McKay's, Eltham.

(The front has been temporarily closed in with glass cloth, as the first section is to be used this year as a brooder house.)

18 feet by 18 feet, with manure pits and nest boxes. More pens can be added as desired at very low cost, as in each section there would be required only the two end walls and the roof, the balance being wire-netting, This model has been exhibited on the Better Farming Train, and has been favorably commented on by many experienced poultrymen. I know of several sheds that have been built somewhat after this model, and they are giving satisfactory results.



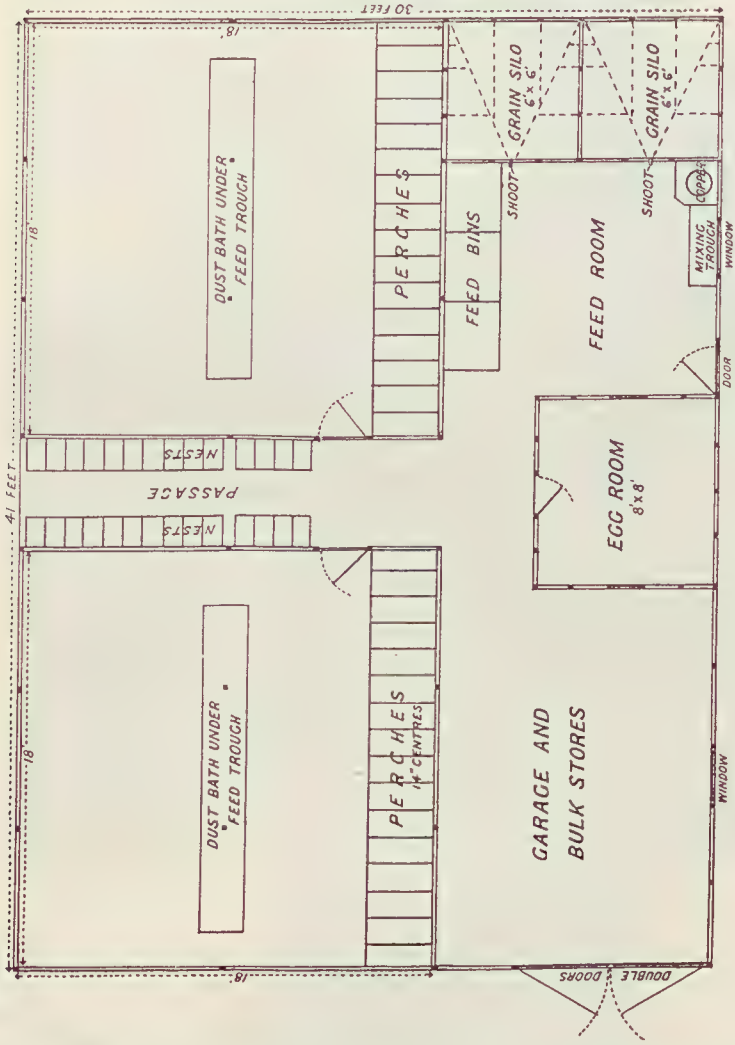
Manure Pit.—One Section Open for Cleaning.

When the Better Farming Train is not on tour the model is stored at my office, 605 Flinders-street, Melbourne, where all who are interested are invited to inspect it. A plan of the building in the model is shown on page 610. In this plan the building of several sheds, one behind the other, is provided for. A list of the material required to build a house of two pens each 18 feet by 18 feet is set out on page 614.

Some poultrymen raise objections to the use of manure-pits below the birds' roosting place. Their principal objections are—(1) that they take up too much floor space, restricting the amount available for the

litter or straw, in which the birds scratch for exercise; (2) that they are a harbour for red mites.

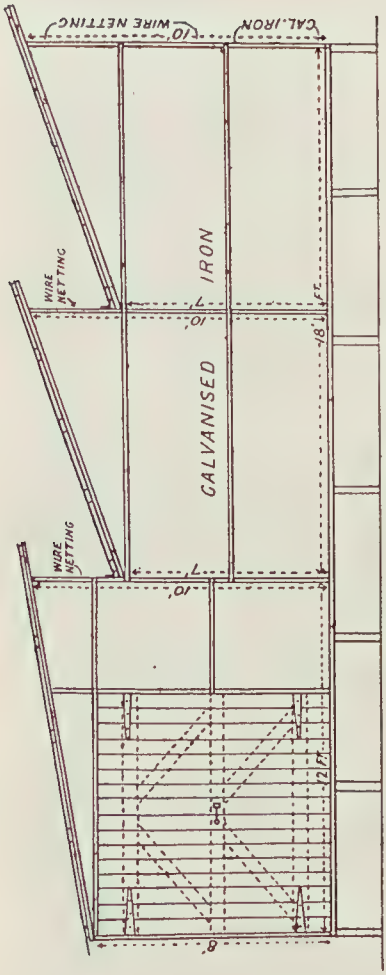
In my opinion, however, the advantages far outweigh the disadvantages. In the first place, it is estimated that over 75 per cent. of a fowl's manure is voided while she is perching; if this amount can be received in the pit, the litter need not be changed so frequently, thus



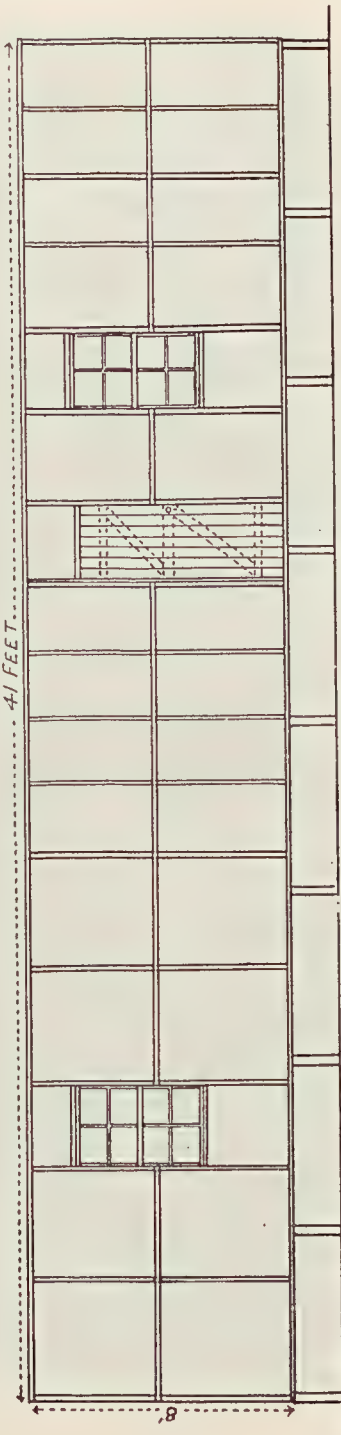
Ground Plan of Model illustrated on page 608.

there will be a saving in the cost and labour of renewing it, and, further, the birds will have better sanitary conditions.

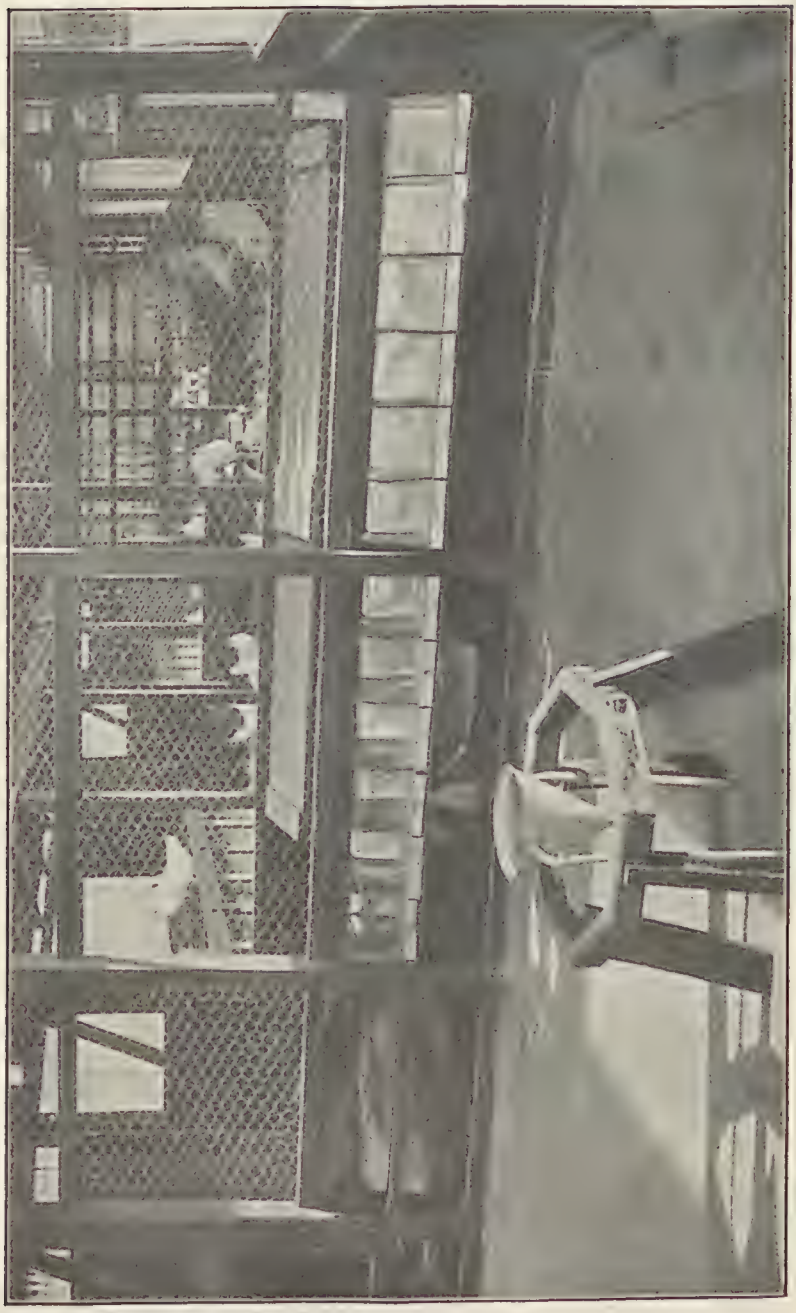
My observations over the last five years have convinced me that the birds get just as much exercise in pens provided with manure-pits as in those wherein there are none, as they are continually flying up and down from the perches.



Plan of Model on page 608.—Side Elevation.



Plan of Model on page 608.—Back Elevation.



Interior of Mr. F. J. McKay's Poultry-shed.

Section of Poultry-shed at Mr. M. G. Leech's Trevallyn Poultry Farm, Campbellfield, showing it as originally constructed. The partitions between the small pens have since been removed.

To guard against red mites, the perches and frames should be given two coats of hot tar before erection. These will fill cracks and gum veins in the timber, which might otherwise provide places in which mites would lay their eggs. Then, with ordinary care in painting or spraying, no more trouble will be experienced than in any other system of perching.

It is important that the floor of the manure-pit be perfectly dry; if it be so, no obnoxious odour will rise even though the pit be not cleaned out for some weeks.

The manure taken from these pits, being free from dirt or straw, can be bagged, and it commands a high price from market gardeners, orchardists, and others.

The illustration shown on page 608 shows a shed on the poultry farm of Mr. F. J. McKay, at Eltham. This shed was built according to the plan on page 610, except that there is a gable roof over the feed-room, &c., whereas the plan provides for a skillion roof.

A shed built by Mr. M. G. Leech, Trevallyn Poultry Farm, Campbellfield, is illustrated on page 613. This shed houses over 2,000 birds, and when first built was divided into small pens to hold twelve birds in each. A number of the partitions, however, have since been removed, and the pens now hold 50 birds in each. Mr. Leech states he is getting most satisfactory results with the enlarged pens.

The list of material required for the building of a shed 41 feet x 30 feet, with saw-tooth roof, capable of housing 160 birds, with an egg-room, feed-room, grain-bins, and garage, is as follows:—

Thirty 3-ft. 3 x 3, jarrah stumps.
Four 16-ft., four 14-ft., four 12-ft., twelve 10-ft., 3 x 2, hardwood wall plates.
Seventy 10-ft., twenty 8-ft., 3 x 2, hardwood studs.
Three 18-ft., six 12-ft., 4 x 2, hardwood rafter bearers.
Twelve 14-ft., sixteen 12-ft., 4 x 2, hardwood rafters.
Four 18-ft., three 16-ft., three 14-ft., fifty-eight 12-ft., 3 x 1¼ hardwood roof and wall battens.
Eight 12-ft., 6 x 1, hardwood gutter boards.
Eight 12-ft., 4 x 1, hardwood gutter boards.
Two 10-ft., two 8-ft., 3 x 1½, hardwood pen door studs.
Four 18-ft., 3 x 1½, hardwood manure-pit framing.
Four 18-ft., four 14-ft., 3 x 1, hardwood framing for nest boxes.
Four 14-ft., six 12-ft., two 10-ft., 2 x 1, hardwood pen doors and movable ends to manure-pit framing.
Eight 10-ft., two 12-ft., 2 x 1, hardwood perches.
Twenty-six 3-ft., 2 x 2, oregon perches.
Five hundred feet, 6 x ⅞, white Baltic doors, feed bins, and trough.
Four 14-ft., one 12-ft., 9 x 1, oregon dust baths.
Twelve 10-ft., 4 x 2, hardwood silo floor framing.
One hundred and fifty 6-ft., 6 x ¼, hardwood silo lining.
Sixteen sheets, 8 x 4, fibrolite egg-room walls and ceiling.
Four 4-ft. x 2-ft 4-in., x 1½, sashes and frames, complete; also gutters and silo.
Thirty-three sheets, 6 x 3 x 26-g., plain-iron covering for nests below lining.
Six sheets, 6 x 2 x 26-g., manure-pit fronts.
Forty-eight 7-ft., ninety-six 6-ft. sheets corrugated galvanized iron roof.
Twenty-six 8-ft., eighteen 7-ft., twenty-four 6-ft., twenty-four 5-ft. sheets corrugated galvanized iron walls.
Twelve yards, 36 x 3 x 16-g., wire-netting perches.
One hundred yards, 36 x 2 x 18-g., wire-netting walls.

PRUNE DRYING.

(Continued from page 507.)

By Francois de Castella, Horticultural Division.

3. Treatment Preparatory to Drying.

Having been properly grown, harvested, &c., drying must be immediately proceeded with. Before doing so, however, the fresh fruit very often undergoes some preparatory treatment, which may vary greatly. French prunes go immediately into the evaporator without any preparation, but most other prunes are treated in some way in order to facilitate the escape of moisture through the skin, one or other of the following being applied:—

Washing in cold water.
Dipping in hot water.
Lye dipping.
Pricking.

Opinions differ greatly concerning such treatment. *Cold-water* washing is scarcely sufficient for prunes grown under dry atmospheric conditions.

Hot water is claimed by some to give good results, especially with tender-skinned sorts such as Imperial—the water should be boiling, and not merely warm.

Lye dipping is more usual. It consists in immersion in a fairly weak and usually hot alkaline solution, for a time varying from a few seconds to nearly a minute, before drying. This removes the bloom and waxy coating on the skin, reduces its toughness, and shortens the drying time, the result being a clean glassy product.

The caustic lye cuts or checks the skin, forming a large number of very minute fissures. Its action must not be too pronounced, so as to result in fewer but larger and deeper cuts; the fruit would then tend to shrivel, with detriment to the appearance of the finished article and a tendency to sugaring on storage.

The strength of the lye varies from 1 lb. of caustic soda (sodium hydroxide) in 10 gallons of water to 1 lb. in 40 gallons. Its action on the skin depends on strength, on temperature, and on duration of immersion. If either of these be reduced, the checking action on the skin will be lessened. One pound to about 20 gallons of water is usual, corresponding to a concentration of 0.4 to 0.5 per cent., at nearly boiling temperature, immersion lasting from a couple of seconds to 15 seconds. Some operators prefer a lower temperature and a longer dip which may last up to half a minute. The condition of the fruit after dipping is the best guide. If cutting is too severe, strength, or time of immersion, or both, should be reduced. Overdipping, either as regards strength or duration, is very injurious; it causes the fruit to bleed and drip, hence faulty fruit and sticky trays.

According to Christie and Barnard—

> Comparative experiments have shown the most efficient temperature to be 200 deg. . . . . or close to the boiling point . . . . if temperature and lye concentration are correct from 5 to 15 seconds is ample. The strength of the solution must be maintained by periodic additions of lye, to replace that

lost mechanically and by partial neutralization of the fruit acid. At the end of each day's dipping, the lye tank should be drained and a fresh solution made up for next day.

Tough-skinned varieties, such as the Robe de Sergeant, require a stronger solution and a longer dip than more tender varieties such as the Imperial Frequent examination of the dipped prunes is necessary to regulate the strength of the dip and time of immersion in order that the majority of the prunes shall develop a number of minute cracks. . . . In general, a short dip in a fairly strong lye solution, close to the boiling point, gives better results than a long dip in a weak or luke-warm lye. If the prunes are so tender as to become partially peeled, it is necessary to reduce the temperature or lye concentration or both. Some growers prefer to dip Imperials merely in warm water to which little or no lye is added.

If the dip cannot be adjusted so as to check all the prunes, the use of a pricker-board is advantageous, because the skins of those prunes not checked by the dip are at least perforated.

According to Wiegand* dipping does not seem to be so generally necessary as is thought in some quarters; at least for the Italian (Fellemberg) prune. He studied the effects of dipping on the drying rate, experimentally at different temperatures and air humidities—

At a temperature of 150 deg. and with medium humidity, it was advantageous to dip, but with high temperature (180 deg. F.) and low medium humidity the untreated fruit dried as quickly as the dipped. He further found "that in most cases the untreated fruit makes the best appearance and packs with the least cracking or splitting after processing," and that this holds good in commercial practice (in Oregon). . . . "When using lye it is advisable to use solutions which are not too strong (not over 1½ per cent.), but to keep them boiling hot. Prunes should not be kept any length of time in this solution."

The evidence concerning lye dipping is thus somewhat contradictory. The fact that the best prunes (French) are not dipped is certainly significant. It must be remembered, however, that in the cool climate of Agen the skin of the plum is thinner than in warmer climes where the atmosphere is drier. Too strong a lye is, no doubt, often harmful to quality. With thoroughly ripe fruit a weak lye is sufficient, if indeed it is needed at all. It is faulty practice to try to process fruit that is not sufficiently ripe by means of a strong lye.

A Cold Dip for Prunes.—This has been used with good results by Mr. W. R. Woodham,† a successful prune-grower of Renmark, South Australia. It is similar to the cold dip, largely used of recent years in the processing of the sultana—

"The strength of the mixture is on much the same lines as that for grapes —10 lb. potash carbonate to 25 gallons water. Oil, I was in the habit of using, but latterly I have omitted it, as I think it interferes with the second processing, preventing the glossy appearance that is essential. Immerse the fruit for about 30 seconds, allow to drain, then place on trays." Subsequent drying is first in the sun and later in the shade, the trays being stacked.

How Dipping is Executed.—In this State prunes are dipped in the same way as raisins (sultanas and lexias). Similar dip tanks, heated by direct fire, and sometimes by steam, are used, the fruit being dipped in the perforated tins in which it is picked. From these it is spread on the trays on which it dries.

In America special dipping machines are used, of which there are various types, the simplest being known as *basket dippers*. These

* *Drying Prunes in Oregon* (1924), p. 9.
† *Murray Pioneer*, 8th February, 1929.

consist of a hinged oblong "basket," with half round bottom of perforated metal or wire-netting. The hinge permits the basket to be lifted out of the lye, after immersion, the fruit drained and tipped on to the drying tray. In more elaborate types the basket tips the fruit into a hopper, whence it passes through a grader that distributes different sizes on to different trays (see Fig. 3). With these machines the green grading that we have seen to be so desirable for even drying (see page 507), is executed after dipping instead of before it. Some of these machines are of the *Rotary Dipper* type, immersion in the lye being secured by means of—

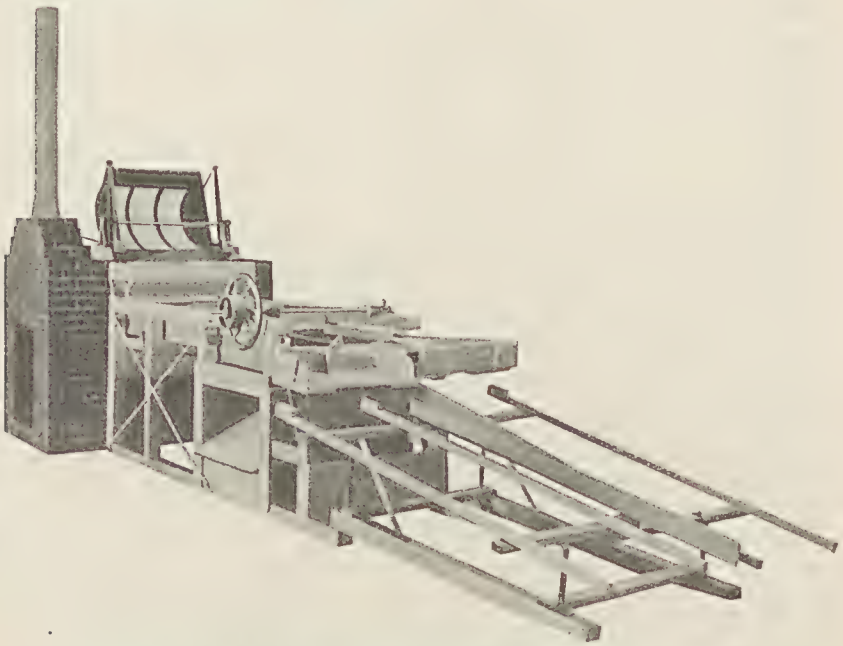


Fig. 3.—Hand-operated basket prune dipper, with lye tank and furnace, connected by power-driven grader. Tray supports in foreground.

[Reproduced from Bulletin No. 388—*The Principles and Practice of Sun-Drying Fruit*—University of California.]

"A rotating perforated metal cylinder, the lower third of which is submerged in the lye solution. The prunes are emptied in at one side and, by means of vanes set at the proper angle on the inner walls of the drum, are carried down through the lye solution and discharged at the opposite side. These dippers are automatic and continuous, and have the greatest capacity. They are operated by a gas engine or electric motor, and the speed of rotation can be varied to regulate the time of immersion."*

Some of these combined dipping, grading, and traying machines are elaborate affairs, power-driven, and needing a dipping crew of up to seven workmen.

The average daily capacity for a typical dipping crew was found to be about 7,000 lb. per man. It is common practice for the crew to dip prunes during the forenoon, and to spread the trayed prunes and do other dry-yard work in the afternoon. Recently mechanical tray-stackers, installed in some orchards, have eliminated two men from the dipping crew.†

* Christie and Barnard, loc. cit., p. 26.
† Ibid. p. 45.

These quotations will give some idea of the way in which prune processing has been industrialized in the United States of America.

Rinsing After Dipping.—Though frequently dispensed with, this is recommended by most authorities, in order to remove the lye with which the fruit is wetted. Rinsing should be effected by dipping in running water or in water that is frequently changed, else it gradually accumulates soda from the fruit. Removal of surplus soda, dirt, &c., can also be effectively accomplished by spraying with water.

Pricking.—The use of pricker-boards is still fairly common in Australia, especially for sun-dried prunes and for plums with thick skins. The minute punctures in the skin permit the escape of water vapour and prevent the formation of what are known as "bloaters." Though formerly popular in America, they are being discarded in that country, especially with artificial drying. "If lye dipping is properly controlled, the use of pricker-boards is of doubtful value, except on very thick-skinned prunes, as bloaters rarely occur on dehydration."* Pricker-boards are not used in France, and are going out of fashion in America.

Details concerning the construction of these boards were given as follows by Mr. C. A. Faulkiner, of Mildura,† who recommended them in preference to dipping, claiming that—

"By this means of pricking I avoid what is called here 'frogs,' so troublesome with dipping in lye, i.e., fruit, the skins of which do not get cracked, and I preserve the beautiful black colour of the prunes."

Pricking is done "by running them (the fresh prunes) down a narrow race or box 12 feet long by 4½ inches wide inside measure, the top of box being 4 feet high from the ground and the bottom 1 foot high. In the bottom of the box are six plaster of paris slabs ⅝ inch thick, in which are embedded small office pins with the points projecting upwards, about ½ inch apart. . . . The pins should be ¾ inch apart each way, so that a slab 2 feet long by 4½ inches wide, having a margin of ¼ inch on each side would contain 32 pins across and 192 pins in length, or a total of 6,144 pins in each slab." Needles were first tried, but discarded, as the acid of the fruit caused the needle points to rust, rendering them useless.

4. Actual Drying.

Up to this stage, treatment of the fruit is on fairly uniform lines, but subsequently it may differ widely. The principle on which preservation by drying is based, is the replacement of the fermentable juice of the fresh plum by a concentrated syrup. Sugar, if in sufficient concentration, acts as a preservative, as it does in jam. This concentration of the juice can be effected by utilizing the sun's heat or by artificial dehydration.

Fresh fruit contains from 60 to 95 per cent. of water, and spoils rapidly. When this is reduced to 20 per cent. to 25 per cent. spoiling can no longer occur. In practice drying is usually pushed somewhat further—to 16 or 20 per cent.—to allow for the absorption of 5 to 10 per cent. of moisture during the final processing, without increasing the moisture content to an amount that would permit spoiling.

Sun and Artificial Drying Compared.—Sun drying takes from fifteen to twenty days; artificial drying about as many hours. The

* Christie, loc. cit., p. 37.
† *Fruit World of Australia*, 1st March, 1909.

tendency of recent years has been to replace the sun by the dehydrator. In France and in Oregon, climatic reasons had long since decided in favour of the latter, but in warmer regions a strong prejudice against artificial drying prevailed a few years ago, especially in California, where the sun's heat is usually available under almost ideal conditions. Not only has this prejudice been dispelled, but the superiority of artificial drying is now generally admitted. Christie and Barnard stated in 1925*—

"If as often occurs towards the latter part of the prune season, weather conditions do not permit of sun-drying, recourse must be had to dehydrators which at a temperature of 165 deg. F., which is safe, can economically complete the drying of the prunes in 24 hours or less without danger of spoiling. In fact, the economic advantages of modern dehydrators for prunes have caused many growers to use them exclusively in preference to the hazardous sun-drying."

In a more recent bulletin† Christie expresses himself even more strongly. His views are summarized as follows:—

"The popular impression which amounted to a conviction with most prune-growers, was that artificial drying could not compete with sun-drying, either in quality of products or economy of operation." (Christie.) Not only has this prejudice been proved to be unfounded, but leading authorities now hold that artificial drying is the better method. It results in a better quality product, and permits a higher yield of the finished article per ton of fresh plums. It further prevents contamination by dust on the drying green, and also ensures complete freedom from insect infection. All eggs or larvae are destroyed during heating; if subsequent infestation be prevented, there is no fear of loss from the grubs so destructive to dried fruit. The increased yield is mainly due to avoidance of fermentation and development of moulds, which waste an appreciable quantity of sugar, in sun-drying. Fermentation is of two classes: Firstly, zymotic or due to yeasts, which often develop to a considerable extent, especially in a bad drying season; secondly, intracellular fermentation, due to the continuance of respiration by the fruit, so long as its tissues are still alive. The high temperature of artificial drying soon kills the fruit and respiration ceases.

Even in a good season, the advantage is with artificial drying. In a bad season it is necessarily much more marked. The wet autumn of 1918 spoiled millions of dollars worth of prunes that were being sun-dried in California, and turned the attention of growers to dehydration, since when there has been a steady increase in this form of drying. According to Christie, the proportion of the total Californian prune pack that was artificially dried increased from 2.9 per cent. in 1921 to 21.2 per cent. in 1925.

The influence on quality is most marked. The supremacy of the French prune from a quality stand-point has already been touched on, and French prunes are always artificially dried; they are indeed a semi-cooked product, stewed in their own steam, and this special treatment seems to considerably influence the development of the characteristic prune flavour, which is most highly developed in the French fruit.

* Loc. cit., p. 51.
† Loc. cit., p. 3, etc.

A good, wholesome prune can certainly be dried in the sun, in a good season; in a showery one, quality suffers. But even in a good season the sun-dried falls short of that which is dehydrated. Even as regards cost, Christie has shown the advantage to be with artificial drying.

Traying.

The trays differ a good deal in pattern and in size, in different regions and according as they are intended for sun or artificial drying. In California sun-drying prune trays are usually 3 feet x 8 feet, made of pine wood, and rough side up, as in this way the fruit sticks less and is more easily removed. In warm, dry climates they can be used two or three times in a season, in cooler regions only once. It is estimated that with fresh prunes, spread closely in a single layer, there is from three to four pounds of fruit per square foot of tray surface, or at the rate of 70 to 90 lb. of green fruit per tray.

In Victoria trays vary, 4 ft. 6 in. x 2 ft. 6 in. being a popular size. Another tray favoured by some consists of a wooden frame 5 ft. 6 in. x 3 ft. on which is stretched wire-netting of ½-in. mesh.

For artificial drying, trays vary a good deal according to the type of dehydrator; 3 feet x 3 feet trays are common; they hold approximately 30 lb. of fresh prunes.

Tray hygiene is of vital importance—

> Clean trays are necessary for the production of clean dried fruit. They must not be dirty, sticky, or mouldy. The use of a stiff bristle or wire brush will remove all dirt, after softening by immersion in a hot washing soda solution. They should be thoroughly washed at the close of each season, rinsed, sulphured, and stored in a suitable building to prevent mould.*

After dipping and rinsing the fruit should be carefully spread without undue crowding. Bruising of the fruit must be avoided when traying and during subsequent handling. In California machines are in general use, which grade, dip, rinse, and spread on the trays in one operation. The dipped prunes, either graded or ungraded, are discharged on to the trays and spread close together, one layer deep only. The larger dipping outfits have a device for shaking the trays to minimize the amount of labour required in spreading. The filled trays are then stacked on trucks for transfer to the dry-yard. In California the cost of dipping and traying is estimated† to average $1.10 per fresh ton.

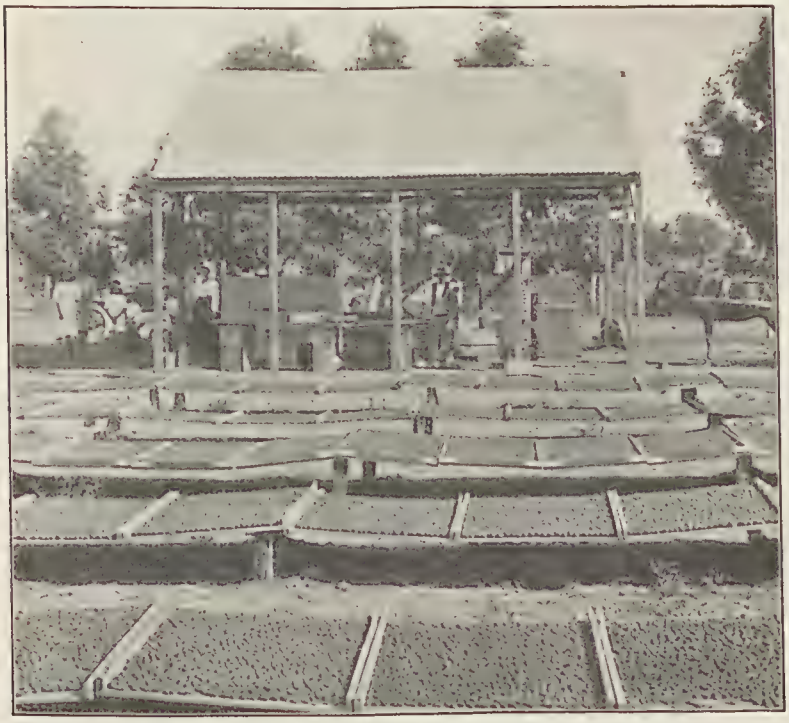
Sulphuring, which is so essential with peaches, apricots, apples, &c., is rarely applied to the prune. It would reduce the colour which the trade demands to be of a rich bluish or purplish black. It would also prevent the development of the characteristic prune flavour. Some prunes, indeed, are sulphured, e.g., the American silver prune and the golden prune, sometimes sold in Melbourne shops. These last are sometimes too heavily treated. A sample purchased in 1929 was found on analysis to contain slightly over 20 grains to the pound of sulphur dioxide, or more than twice the amount permitted by the Public Health regulations. Cooked in the ordinary way, the "sulphur" taste was very evident; after prolonged stewing to eliminate the SO_2, they were of agreeable flavour, but tasted like stewed fresh plums, and did not resemble the true prune in any way.

* Christie and Barnard, loc. cit., p. 32.
† Ibid., loc. cit., p. 45.

Sun Drying.

Sun-drying is simple in good weather. The fruit, spread on the trays, is merely exposed to the sun's rays on the drying green. The duration of the drying period naturally depends on the weather. It usually takes from ten to twenty days. With large fruit, turning is desirable; it can be effected by means of rakes or by placing an empty tray on top of the full one and rapidly rotating the two, thus transferring the fruit to the empty tray.

Drying must be sufficient for the fruit to keep, but it must not be excessive. Over-drying must be avoided. No amount of processing will bring an over-dried prune back to what it should have been.



Drying Prunes at Mr. Guy Levick's Orchard, Lockington.

It is not an easy matter to judge the exact moment when drying is sufficient. According to Hendrickson, "When the prune has become firm in texture, and the pit cannot be separated from the flesh by rolling between the thumb and fingers, it is usually considered cured. Another method of determining when the drying is complete is by squeezing a handful. If the prunes retain their shape and do not mash together, they are dried sufficiently."

The following information has been abridged from *University of California Bulletin,* No. 388*:—

After dipping and spreading, the trays of prunes are transferred by truck to the dry-yard and spread in the sunshine, but never later than 3 or 4 p.m. The trays are laid in rows extending north and south, at right angles to the

* Christie and Barnard.

trucks. The north side of each tray should rest on the south edge of the preceding tray.* Space is thus economized, the trays are kept cleaner, and picking up is facilitated. Drying takes place in two stages. The first consists of direct exposure to the sun. This warms the fruit and quickly dries the surface. The sunlight causes an "after ripening" of the colour, which becomes deep and rich. For the second stage, the trays are stacked. This has several advantages. The fruit is freer from dust. It retains a softer skin, and excessive darkening and loss of flavour are prevented. The slower evaporation promotes equal drying, and over-drying, with consequent loss of weight, is avoided.

The trays are not stacked until the prunes are about three-fourths dried,† or they may spoil. This requires from five to ten days in dry weather. During this period large prunes, especially Imperials and Sugars, should be stirred by hand or a wooden rake. This prevents their sticking to the tray, drying is more rapid and uniform, and loss from mould or fermentation is minimized. The trays are then stacked in a staggered pile with the open ends in the direction of the prevailing wind. It is rarely possible to dry prunes in less than ten days, and the average time in favorable weather is two weeks.

Prunes are sufficiently dry when the flesh, especially that round the pit, has changed to a thick or stiff syrupy condition and clings tight to the pit. When a handful is squeezed hard, the prunes should be sufficiently flexible to form a compact mass and yet not soft enough to stick together, when the pressure is released. If some pits are cracked the kernels should be found dry and shrunken.

There are usually some prunes which do not dry satisfactorily and form what are popularly referred to as "bloaters," "frogs," "chocolates," &c. All such defective prunes should be carefully culled out either during drying or before the trays are emptied. Failure to do this will seriously lower the quality of the entire output.

The average number of dry-yard employees, exclusive of the dipping crew, was found to be one man to each 15 acres of bearing orchard. The average cost of all dry-yard labour, exclusive of dipping, was found to be about $2.40 a green ton at a rate of 40 cents an hour.

In the case of rain or heavy fog during the drying season the trays must be closely stacked, and each stack covered with empty trays, canvas, or a sheet of corrugated iron to prevent the prunes and trays from getting wet. If the prunes are already partially dried and the damp weather is of short duration, no serious damage will result. As soon as the air is comparatively dry again the trays should be placed on the ground to complete the drying.

* This is for California—in Australia this arrangement should be reversed.
† Apricots and peaches are stacked earlier—when quarter to half dried. (Christie and Barnard.)

(To be continued.)

RUTHERGLEN EXPERIMENT FARM.

The Purpose of the Farm.

The Rutherglen Experiment Farm was established in 1912 for the purpose of assisting the agricultural development of the north-eastern areas of the State.

The object of the farm is not to attain financially profitable results as far as the farm itself is concerned, but to confer on agriculture the benefits of modern scientific advances by the prosecution of investigations and trials under practical and accurately-recorded conditions concerning the problems involved in increasing the agricultural output of the State.

The principal experiments now in progress comprise—

Variety tests of wheat and oats.
Permanent rotation tests.
Green manurial tests with wheat and oats.
Permanent manurial tests—wheat and oats.
Soil moisture and nitrification investigations.
Cultivation tests with wheat.
Smut control investigations—wheat and oats.
Time and rate of seeding tests with wheat.
Pasture top-dressing tests.
Grass and clover improvement trials.

The farm is located adjacent to the Government Viticultural Station, and is 5 miles south-east of the Rutherglen railway station. Its total area is 1,100 acres, of which 150 acres are laid out in experiment plots. The balance is devoted to the production of pedigreed seed wheat and oats, the maintenance of a registered Border Leicester stud, and to general mixed farming.

Soils.—Three distinct soil types are present—

(*a*) Grey cementy loams, containing buckshot, on the low-lying parts. These soils are imperfectly drained and difficult to cultivate.
(*b*) Friable red loams, usually well drained.
(*c*) Gravelly hill soils.

Seasonal Conditions.—The average annual rainfall since 1912 is 21.0 inches. During the current year, the winter rainfall was far below the average, only 9.80 inches having been registered to 30th September.

However, the season has been favourable for the growth of cereal crops. Good April and May rains provided excellent sowing conditions, and the winter rains were sufficient for all but late-sown crops. Good October rains, 240 points to the 13th of the month, have assured good yields and abundant grass.

Crops and Live Stock.

The following figures show the details of the crops grown and stock carried on the Experiment Farm at the 1st October:—

Experimental area	150 acres
Wheat crops	120 „
Oat crops	111 „
Wimmera rye grass (for seed only)	2 „
Fallow	150 „
Pasture	567 „

Live Stock.

Draught horses	19
Light horses and young draught stock	14
Dairy cattle, young cattle, and calves	40

Sheep.

Border Leicester (stud ewes)	220
„ „ (rams for sale)	70
Flock ewes	275
Dry sheep	130
Total sheep	625
Total lambs	390

Pigs.

Miscellaneous	90

Miscellaneous Cereal Tests.

Variety Tests of Wheat and Oats.

Sown on Fallow.

These comprise three sections as follow:—

(*a*) *Variety Observation Plots* (Fields Nos. 1 and 3).

These plots are 1-100th acre in area, every fifth variety being a check plot of the standard variety Federation for wheat and Algerian for oats. The object of these plots is to observe the behaviour of new varieties under Rutherglen conditions. The produce of the plots is used to sow the larger variety tests. Each year seed for these plots is obtained from the State Research Farm, Werribee, so that uniformity of type of the various varieties grown by the Department may be maintained.

(*b*) *Variety Plots* (No. 2 Field—Permanent experimental section).

Twenty-seven wheat varieties, each sown with a check plot of the Federation variety on either side, are being tested in plots 1-9th of an acre in area. Those varieties that warrant it are later compared in more accurate replicated trials (see section C).

Eight varieties of oats are under test in the same field, using the replicated system with the standard variety Algerian. These plots are cut for hay, the produce then being threshed to obtain the grain yield. In the past, this section has been sown on fallow only, but this year the test with oats has been repeated on wheat stubble land also.

The oats were sown on the 29th April with 70 lb. of seed and 1 cwt. of super. per acre; the wheat was sown on the 16th-19th May, using 75 lb. of seed with 1 cwt. of super. per acre.

(*c*) *Replicated Yield Trials* (Field No. 3).

After graduation in the foregoing plots, varieties considered true to type and worthy of exact test are compared by the most accurate method available (modified half-strip replicated system). Each variety is sown six times over, each time alongside a check plot of the standard variety, Federation. Each plot is 1-30th acre in area. The varieties being tested this year are Federation, Free Gallipoli, Turvey, Ghurka, Major, and Sepoy. They were sown on 16th May, with 75 lb. seed and 1 cwt. super. per acre. These varieties have been chosen in order to ascertain the best of the principal varieties grown in the north-eastern district.

Results of Variety Trials.

Wheat.

During the past eighteen years, many commonly grown wheat varieties, in addition to a large number of unnamed crossbreds, have been tried.

As a result, many varieties have been discarded, and the most prolific named varieties are found to be those mentioned in section C above. Several new varieties show great promise, but need further trial before they can be recommended.

Average Results, 1927-29.

Area of Plots—One-ninth acre.

Wheat Variety.	Average Yield per Acre, 1927–29.
	Bushels.
Federation x Major, 6914, F 3–3	28·2
Ghurka	28·2
Sepoy	27·9
Free Gallipoli	27·3
Penny x Currawa, 6655, D 1–1	27·3
Rance x Rajah, 5013, E 4	27·1
Ind. H x Telfords Seln., 66	27·1
Gallipoli, 76 I	26·4
Major	26·4
Turvey	25·6
Waratah	25·5
Gallipoli x Federation, 5006–4–1	25·5
Federation	25·4
Rance (L 4119–2)	25·3
Currawa x (Ind. E x Telford's) 7800 D 7–2	25·2
Currawa x Major x Gallipoli, 5319 F 3–3	25·1
Bena	24·5
College King	24·3
Gallipoli x Federation, 5006–5–1	24·3
Alliance	24·0
Nizam	23·9
Rajah	23·5
Gallipoli x Federation, 5008–5–1	23·4
Currawa	22·8
Yandilla King	22·5

Seed Wheat for Distribution, 1931.

Pure pedigreed graded seed wheat and oats of the following varieties will be available for distribution in 1931. Applications for limited quantities should be forwarded by the 1st February:—

Wheat.—Free Gallipoli, Ghurka, Federation.
Oats.—Algerian, Palestine.

Oat Variety Trials (No. 2 Field).

The North-Eastern District is eminently suited to oat growing, either for hay and grain production, or as a forage for sheep. Algerian oats, a late-maturing variety, is the standard variety grown. Although several other varieties have given higher yields of hay in the recent

dry years, their performance in normal seasons has yet to be observed. For grain purposes alone, Palestine, an early-maturing short-strawed variety, has produced 10 bushels per acre more than Algerian during the last three years.

As the oats in this field are not fed off, the suitability of various varieties for grazing purposes is being tested in Field No. 7.

Average Results for Three Years, 1927-29.

Hay.

	Hay-cwt. per acre.
Wild Oat x Ruakura	48.2
Lachlan	47.2
Algerian	40.5
Mulga	38.8
Sunrise	38.1

Grain.

	Bushels per acre.
Palestine	49.8
Wild Oat x Ruakura	48.8
Lachlan	47.9
Algerian	39.2

Permanent Rotation Trials (No. 1 Field).

The object of the tests in this field is to determine the most profitable system of farming under conditions similar to those at Rutherglen. Eleven crop sequences, comprising 30 plots, are included in these tests, and in all of them wheat is the principal revenue-producing crop. An important part of the work is the series of plots designed to determine whether, under changed conditions at Rutherglen, the customary bare fallow can be replaced by a forage crop. The amount of grazing provided and any gain or loss in live weight of the sheep are recorded.

The average yield of the wheat crop grown in each rotation system is given below.

Rotation Trials.

Plots—Three-eighths acre.

Rotation No.	Rotation System.	Average Wheat Yield for Fourteen Years. Bushels per Acre.
1	Fallow—wheat	21·8
2	Peas—wheat	20·8
3	Rape—wheat	21·8
4	Rape—peas—wheat	22·0
5	Rape—barley—peas—wheat	22·0
6	Rye and Vetches—wheat	16·7
7	Wheat continuously	7·6
8	Sorghum (Sudan grass)—wheat	17·2
9	Pasture—fallow—wheat	19·4
10	Sorghum (Sudan grass)—peas—barley—fallow—wheat	20·7
11	Oats—pasture—fallow—wheat	20·8

From such an experiment, in which in some instances the cycle is not completed under five years, quick results cannot be expected. Nevertheless, some striking differences in growth are to be observed in the field, and in some instances the yield of wheat has already been shown to have been affected by the rotation practised. Land that has been continuously cropped to wheat, for instance, has produced an average yield of only 8½ bushels, or about one-third of that obtained when the wheat crop has followed a bare-fallow. The substitution of a summer forage crop, Sudan grass, for the bare fallow has reduced the wheat yield by 4.6 bushels per acre.

Where rye and vetches have been alternated with wheat, there has been a notable reduction in yield. In this case the reduction is partly due to the fact that Take-all affects both crops in this rotation.

When either of the forages, peas or rape, is sown in the autumn, and fed off during the winter and early spring, and the land immediately fallowed, the yield of wheat grown on this fallow apparently is not reduced. This result conforms with that obtained at the State Research Farm, Werribee. However, neither of these forages can be recommended for Rutherglen conditions, as they do not furnish satisfactory grazing returns here. Oats, as a forage crop, has not been tested in these rotations, but, judging from the results obtained at Werribee, this crop is likely to provide increased financial returns as compared with peas or rape.

In 1930, the green forages were sown early in April, fed off during the winter and spring, and the land then ploughed in October in preparation for the following wheat crop in 1931.

Feeding Off and Green Manurial Tests (No. 2 Field).

The objects of these tests are—

(1) To determine whether the customary fallow for wheat can profitably be replaced by a forage crop.

(2) To investigate the most economical method of restoring humus to worn-out wheat soils.

This may be done by growing forages, and then either

(*a*) Feeding them off with sheep; or

(*b*) Ploughing them under as green manure.

Outline of Experiment.—The forages under test are rape, barley, peas, rye, and vetches. In the first series each forage crop is sown in the autumn, and fed off with sheep during the winter and early spring, and the plot immediately fallowed. Wheat for grain is sown in the following autumn on this late fallow. Wheat is grown also after bare fallow for the purpose of comparison.

In the second series of plots the treatment is identical with the above, except that the forages are ploughed in as green manure instead of being fed off.

The number of sheep grazed on each plot, and their gain or loss in weight, are recorded. The plots are each one-fifth of an acre in area.

In 1921, the wheat plots were halved, one-half being sown with wheat and the other with oats. The effect of ploughing in and feeding off green forage crops on a following oat crop will thus be determined.

Results, Feeding Off, and Green Manurial Tests.

Yields obtained with wheat grown after bare fallow and in rotation with forages fed off to sheep, and also with the same forages ploughed under (average for twelve years):—

Rotation.	Average Wheat Yield for Twelve Years. Bushels per Acre.
Series 1—	
Wheat after rape—fed off	18·8
Wheat after barley—fed off	14·4
Wheat after peas—fed off	18·1
Wheat after rye and vetches—fed off	18·4
Wheat after bare fallow	19·2
Series 2—	
Wheat after rape—ploughed in	17·6
Wheat after barley—ploughed in	11·4
Wheat after peas—ploughed in	16·6
Wheat after rye and vetches—ploughed in	18·1
Wheat after bare fallow	19·0

The test is confirmatory to that made in the rotation field in showing that after rape and peas are fed off to sheep under Rutherglen conditions, the yield of wheat is quite as satisfactory as where the wheat is grown after bare fallow. Unfortunately, both rape and peas have not proved economical to grow at Rutherglen, hence cannot be recommended for simliar soils in the district. The tests confirm those at the State Research Farm, Werribee, in showing that, if barley is used as a forage crop in this way, material reduction in the yield of subsequent wheat crops is likely. So far, oats has not been tested as a forage crop in this particular field, but shortly steps will be taken to do so.

One outstanding result of the test has been the failure of any of the forage crops when ploughed in to increase the yield of wheat. The unsatisfactory effect of barley when used as a green manure preceding wheat will also be noticed. The result undoubtedly is due to the presence of Take-all disease in the barley and its transference into the wheat crop.

In order to ascertain whether the cumulative effect of the green crops on the soil is being masked by the green crop depleting the soil of moisture and thus limiting the growth of wheat, the two series of plots in this field will be left in fallow during 1930 and 1931, instead of being sown to green crops, as usual. The wheat crops grown on these plots in 1931 and 1932 respectively will show whether the green crops ploughed in and fed-off since 1913 have increased the soil fertility.

Manurial Trials, Wheat and Oats (No. 1 Field).

Twenty wheat and twenty oat plots are embraced in this section. The plots, 1-10th acre each, are sown on land alternately under crop and bare-fallow, and the site of each plot is permanent. In respect to all other factors, such as cultivation, seeding, &c., the plots are treated as uniformly as possible. This season oats were sown on 15th April, with 65 lb. seed, and wheat on 1st May, with 75 lb. seed per acre.

The results from this section, showing the average yields of wheat for fifteen years, and of oats for seven years, are set out in the following table:—

Manurial Trials, Wheat and Oats.

Federation wheat and Algerian oats are the varieties used each year.

Manure Applied per Acre.	Wheat—Average Yields for Fifteen Years.	Oats—Average Yields for Seven Years.
	Bushels per acre	Bushels per acre.
Farmyard manure, 10 tons	21·4	39·1
Farmyard manure, 10 tons + lime, 10 cwt.	21·9	38·7
No manure	12·0	25·8
Super., ½ cwt.	20·3	39·7
Super., 2 cwt.	22·7	43·2
Super., 1 cwt.	21·4	44·0
Super., 1 cwt. + nitrate of soda, ½ cwt. (with seed)	24·3	44·4
Super., 1 cwt. + nitrate of soda, ½ cwt. (in spring)	22·7	46·3
Super., 1 cwt. + sulphate of ammonia, 44 lb.	23·2	46·2
Super., 1 cwt. + sulphate of ammonia, 44 lb. + sulphate of potash, ½ cwt.	21·1	46·6
No manure	12·0	27·4
Bone Fertilizer, 1 cwt.	20·4	41·2
Basic Slag, 1 cwt.	20·9	39·7
Basic Slag, ½ cwt. + super., ½ cwt.	22·1	45·4
Super., 1 cwt.	21·4	43·0
Super., 1 cwt. + lime, 5 cwt.	23·9	46·7
Super., 1 cwt. + lime, 10 cwt.	23·5	43·9
Super., 1 cwt. + lime, 20 cwt.	24·8	46·7
No manure	11·7	23·5
Super, 1 cwt. + sulphate of potash, ½ cwt.	21·8	43·9

Note.—No lime or stable manure applied since 1923.

It is evident from a perusal of these results that the application of superphosphate has given the most profitable results for wheat. The use of other manures, such as nitrate of soda, &c., in conjunction with superphosphate, apparently has given increases, but such increases have not been sufficient to justify the additional expense incurred. The yields from the plots treated with varying quantities of superphosphate indicate that it pays to apply 1 cwt. of superphosphate with either wheat or oats sown on fallow. The following table shows the profit resulting from the use of the several dressings with wheat and oats:—

PROFIT DUE TO USE OF SUPERPHOSPHATE.

Manure applied per Acre.	Yield—Bushels per Acre.	Increase over No Manure. Bushels per Acre.	Value of Increase at 3s. 6d. per Bushel.	Cost of Manure at 5s. 6d. cwt.	Net Profit due to Use of Manure.
			s. d.	*s. d.*	*s. d.*
Wheat.—Fifteen years average.					
No manure ..	12·0	..	..	..	..
Super., ½ cwt. ..	20·3	8·3	29 1	2 9	26 4
Super., 1 cwt. ..	21·4	9·4	32 11	5 6	27 5
Super., 2 cwt. ..	22.7	10·7	37 5	11 0	26 5
Oats.—Five years average.			at 2s. 6d. bus.		
No manure ..	25·8	..	..	..	..
Super., ½ cwt. ..	39·7	13·9	34 9	2 9	32 0
Super., 1 cwt. ..	44·0	18·2	45 6	5 6	40 0
Super., 2 cwt. ..	43·2	17·4	43 6	11 0	32 6

Residual Trials.

In order to ascertain the residual effect of the manurial dressings applied during the past fifteen years, all of the plots which are usually sown with manures, as shown in the table above, have this year been sown without manure.

Nitrogenous Manures.

For fifteen years, the effect of applications of the nitrogenous manures, sulphate of ammonia, and nitrate of soda, in conjunction with superphosphate, has been measured in the permanent manurial field.

In four of these years, namely, 1922, 1923, 1927, and 1928, the yields of wheat were considerably increased, due to these manures. In the remaining eleven years, however, no definite increases were obtained. The average figures, as shown in the above tables, indicate that the application of nitrogenous manures to wheat on fallow has been unprofitable at Rutherglen, where the soil is a grey cementy loam and the average annual rainfall 21.8 inches.

In order to study more completely the action of nitrogenous manures, particularly sulphate of ammonia, replicated trials with wheat sown on both fallow and stubble ground were carried out in 1929. The rainfall for the year was 16½ inches, and the yields per acre high.

Trial of Nitrogenous Manures, 1929.

A.—*Fallow Ground.*—Ploughed August, 1928; harrowed once and scarified four times before sowing on 24th May with 75 lb. Federation seed per acre, and manures as shown. The germination was good, but the early growth of all plots treated with sulphate of ammonia in addition to superphosphate was slow. Following the August rains, the wheat on these plots appeared to overtake the wheat sown with superphosphate alone, but they did not yield so heavily.

B.—*Stubble Ground.*—Sown to wheat in 1928, yielding a nine-bag crop. Stubble ploughed in early April, 1929; then harrowed, scarified, and sown on the 18th May, 1928, with 75 lb. Federation wheat per acre. The early growth of these plots was similar to that on those sown

on fallow, but the differences between the yields of the wheat sown with superphosphate plus nitrogenous manures and those sown with superphosphate alone were very small.

The plots were each 1-40th acre in area, and the detailed results as follow:—

Plot No.	Manure Applied per Acre.	Yield in Bushel per Acre.	
		Fallow.	Stubble.
1	Super. 1 cwt., plus Sulphate of Ammonia ¼ cwt. ..	38·0	32·7
2	Super. 1 cwt.	42·3	32·0
3	Super. 1 cwt., plus Sulphate of Ammonia ½ cwt. ..	38·0	32·1
4	Super. 1 cwt., plus Sulphate of Ammonia ½ cwt. ..	36·0	31·3
5	Super. 1 cwt.	42·0	31·7
6	Super. 1 cwt., plus Sulphate of Ammonia ¼ cwt. ..	35·5	30·3
7	Super. 1 cwt., plus Sulphate of Ammonia ¼ cwt. ..	*	31·3
8	Super. 1 cwt.	36·5	31·3
9	Super. 1 cwt., plus Sulphate of Ammonia ½ cwt. ..	33·2	31·1
10	Super. 1 cwt., plus Sulphate of Ammonia ½ cwt. ..	35·2	30·9
11	Super. 1 cwt.	39·2	31·3
12	Super. 1 cwt., plus Sulphate of Ammonia ¼ cwt. ..	*	30·7
13	Super. 1 cwt., plus Sulphate of Ammonia 1 cwt. ..	37·5	29·1
14	Super. 1 cwt.	39·7	29·0
15	Super. 1 cwt., plus Sulphate of Ammonia ½ cwt. ..	34·8	28·7
16	Super. 1 cwt., plus Sulphate of Ammonia ½ cwt. ..	36·7	30·0
17	Super. 1 cwt.	38·8	27·7
18	Super. 1 cwt., plus Sulphate of Ammonia 1 cwt. ..	32·5	27·7
19	Super. 1 cwt., plus Sulphate of Ammonia 1 cwt. ..	34·3	29·1
20	Super. 1 cwt.	38·7	29·3
21	Super. 1 cwt., plus Sulphate of Ammonia ½ cwt. ..	34·3	30·1
22	Super. 1 cwt., plus Sulphate of Ammonia ½ cwt. ..	34·3	30·0
23	Super. 1 cwt.	38·7	29·3
24	Super. 1 cwt., plus Sulphate of Ammonia 1 cwt. ..	31·3	26.6
25	Super. 1 cwt.	37·7	29·9
26	No manure	24.3	21·4
27	Sulphate of Ammonia ¼ cwt.	24·7	20·1
28	Sulphate of Ammonia ½ cwt.	23·7	20·0
29	No manure	28·2	21·3
30	Super. 1 cwt.	40·0	31·1
31	Super. 1 cwt.	38·5	31·7
32	No manure	27·3	21·7
33	Sulphate of Ammonia ½ cwt.	25·3	19·3
34	Sulphate of Ammonia ½ cwt.	28·5	21·6
35	No manure	26·3	18·3
36	Super. 1 cwt.	36·0	33·6

* Results not available.

The average results of the various sections are summarized below:—

Manure Applied per Acre.	Yield in bushels per Acre.	
	Fallow.	Stubble.
Super. 1 cwt.	39·1	30·7
Super. 1 cwt., plus Sulphate of Ammonia ¼ cwt. ..	36·7	31·2
Super. 1 cwt., plus Sulphate of Ammonia ½ cwt. ..	35·1	30·5
Super. 1 cwt., plus Sulphate of Ammonia 1 cwt. ..	33·9	28·1
Sulphate of Ammonia (alone) ½ cwt.	25·5	20·3
No manure	26·6	20·7

Observation Plots.—A number of single plots were treated with sulphate of ammonia and nitrate of soda, both with the seed and as top-dressings, at intervals of 21 days from the time of sowing until 26th September. In no case was any appreciable response to the nitrogenous manures noticed. The experiment will be repeated to obtain data for an average year.

CULTIVATION TESTS.

Cultivation Tests with Wheat (No. 2 Field).

These comprise twelve plots each 1-5th acre in area.

The object of the tests is to compare the yields of wheat sown on a series of plots tilled in various ways. A depth of ploughing test is included. Plots were sown on the 2nd May with 1 cwt. superphosphate and 75 lb. seed per acre.

The average yields of wheat from the plots for fifteen years are as under:—

Cultivation Tests, Wheat.

Average Results for Fifteen Years.

Treatment of Plot.	Yield per Acre.
	Bushels.
Ploughed 3 inches July, and well worked	21·5
Ploughed 5 inches July, and well worked	25·7
Ploughed 7 inches July, and well worked	27·2
Ploughed 9 inches July, and well worked	25·5
*Ploughed 3 inches July, subsoiled, and well worked	23·3
*Ploughed 5 inches July, subsoiled, and well worked	24·8
*Ploughed 7 inches July, subsoiled, and well worked	25·5
Ploughed 5 inches July, and well worked	21·5
Ploughed 5 inches July, and neglected	15·4
Ploughed 5 inches October, and well worked	19·8
Ploughed 5 inches October, and neglected	18·4
Ploughed 5 inches just before seeding	12·0

* Not subsoiled since 1923.

Plots sown with Federation wheat 75 lb. per acre, superphosphate 1 cwt. per acre.

All the plots are grazed with sheep when necessary, in order to check weeds.

It is apparent that shallow ploughing, practised so successfully in other wheat districts, is not advisable under the conditions at Rutherglen. The yields show an improvement as the depth of ploughing increases from 3 inches to 7 inches; beyond that depth, 9-in. ploughing, a decrease is evident. Subsoiling has had no appreciable influence on the yields, and the results are in agreement with those from the depth of ploughing section. Despite the subsoiling, the deeper ploughing still shows a beneficial influence on the crop. The yields from the early and late followed, cultivated and non-cultivated, and non-fallow plots, afford interesting comparisons, and demonstrate convincingly the superiority of the early and well-worked fallow.

Research into Fallowing Methods (No. 12 Field, Glasshouse and Laboratory).

This investigation is designed to determine the extent to which soil moisture and plant foods are affected by various cultivation methods. The soil conditions from the time of ploughing to the harvesting of the crop are being studied in detail by chemical and physical methods. The results obtained should throw considerable light on the fundamental principles of fallowing.

Rate and Time of Seeding Trials (No. 14 Field).

The average result of these trials with wheat indicate that maximum yields are obtained by sowing before mid-May with at least 75 lb. of seed per acre. Sowing after this time involves a much greater risk than does early sowing under Rutherglen conditions.

Average Results, 1927-29 (Seed 75 lb. per Acre).

	Bushels per acre.
Early sowing (late April)	30.8
Normal sowing (early May)	30.2
Late sowing (late May-early June)	26.9

Harvesting Permanent Rotation Tests, Rutherglen Experiment Farm.

Wheat Pickling Trials (No. 1 Field).

These plots are part of an extensive series of pickling experiments being conducted by the Department at Rutherglen, Longerenong, and Werribee.

The object of the tests is to compare the results obtained with the different pickling methods used for the control of ball smut, and also to determine the relative efficiency of the various commercial dry-pickling powders. Each treatment has been repeated six times.

It is usually found that dry-pickled seed germinates and grows more quickly than does seed treated with bluestone on formalin. This advantage is particularly important when germination conditions are unfavorable, as is comomon with the later sowings at Rutherglen.

Yield Trials (Sown early June).

Seed Treatment.	Average yield, 1925-29. Bushels per acre.
Dry pickled, 2 oz. per bushel	26.8
Formalin, 1-450 (3 minutes' immersion)	23.8
Bluestone, 1¼ per cent. (3 minutes' immersion) ..	22.4

Each of the treatments used proved satisfactory in controlling the smut.

Comparison of the Commercial Dry-pickling Powders.—This trial consists of a number of small drill-sown plots, in which fourteen commercial copper powders are being tested against standard copper carbonate. In order that these powders may be tested under severe conditions, the wheat has been heavily smutted, and lighter dressings of powder than normal have been used.

Oat Pickling Trials (No. 1 Field).

In 1929, the oats in the Rutherglen district were severely affected by head smuts, up to 35 per cent. infection being recorded. Experiments conducted in the same year showed that the dry-pickling method, now generally used to control ball smut in wheat, is a satisfactory, though not a perfect, method for the control of oat smut also.

Although few farmers pickle their seed oats, it is advisable that this should be done unless the crop from which the seed was obtained was perfectly free from smut. The experiment has bene repeated this year with both wet and dry pickles.

PASTURE IMPROVEMENT.

The carrying capacity of virgin pasture in the Rutherglen district is approximately one breeding ewe to 1½ acres. In order to test the possibility of increasing the carrying capacity, the following tests are being carried out:—

1. Pasture top-dressing tests. Fields Nos. 13, 5, 6, 9, and 15.
2. Establishment of sown-down pasture, principally Subterranean Clover and Wimmera Rye Grass, when the land is thrown out to pasture after the cultivation of cereal crops, viz., fields Nos. 9, 10A, and 15.
3. Improvement of grasses and clover by selection.

Pasture Top-Dressing Tests.

An area of poor virgin pasture is divided into five plots of 3¾ acres each, four of which have been top-dressed as follows:—(1) Superphosphate, 1 cwt. + lime 10 cwt. per acre; (2) superphosphate, 1 cwt. per acre; (3) Thomas phosphate, 1 cwt. per acre; (4) superphosphate, 2 cwt. + nitrate of soda 1 cwt. per acre. These plots were manured every year from 1914 until 1920, since when the practice of manuring only every fourth year has been followed, being last manured in 1928. The remaining plot has not received any manure.

Originally the plots functioned mainly as demonstration areas, but for the past ten years a record has been kept of the number of days' grazing afforded, and of any loss or gain in the live weight of the sheep.

Every year marked differences in the quantity and quality of the pasture provided in the several plots are apparent.

The most obvious differences to the eye are the increased numbers of early grasses and trefoils in the manured sections. This type of pasture has largely replaced the tufty root grasses, which may still be seen in the unmanured plot.

The results of grazing over the past ten years, together with botanical and chemical analyses of the produce of plots, are summarized in the following tables:—

Pasture Top-dressing Tests.

Sheep-grazing Trials.

Average Results for Ten Years, 1920 to 1929.

	Super., 1 cwt., Lime, 10 cwt. per Acre.		Super., 1 cwt. per Acre.		No Manure.		Basic Slag 1 cwt., per Acre.		Super., 2 cwt., Nitrate of Soda, 1 cwt. per Acre.	
	Sheep Carried.	Lb. Gain—Live-weight.	Sheep Carried.	Lb. Gain—Live-weight.	Sheep Carried.	Lb. Gain—Live-weight.	Sheep Carried.	Lb. Gain—Live-weight.	Sheep Carried.	Lb. Gain—Live-weight.
	Per acre.	Per acre.	Per acre.	Per acre.	Per acre.	Per acre.	Per acre.	Per acre.	Per acre.	Per acre.
Average for nine years, 1920–29 ..	1·4	103	1·3	82	0·8	51	1·2	74	1·4	97
1929 only ..	2·4	132	2·4	97	1·3	86	2·1	91	2·2	117

Analyses of Mixed Pastures (1928).

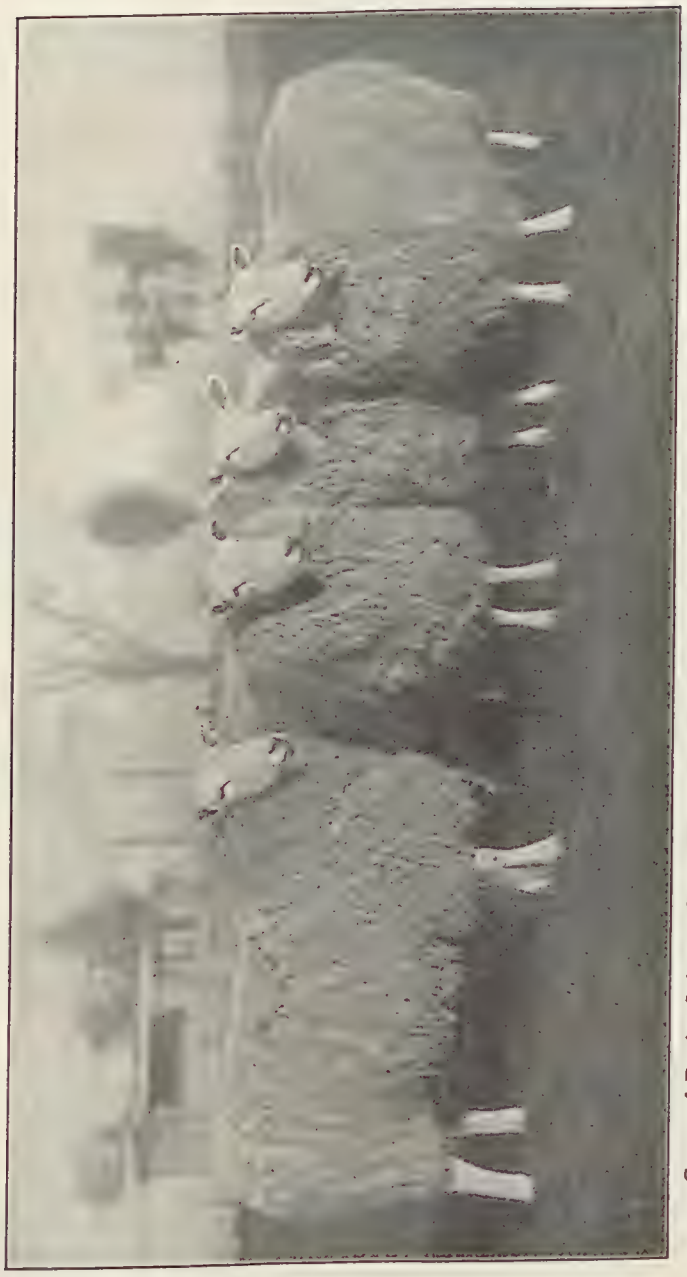
Botanical Analysis.

	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Grasses ..	70	71	89	71	69
Clovers ..	29	25	0	23	16
Weeds ..	1	4	11	6	15

Analysis of Ash (1920).

Nitrogen ..	2·2	2·3	1·5	..	..
Phosphoric Acid ..	0·5	0·6	0·3	..	..
Lime ..	1·4	1·5	0·6	..	..

The figures indicate that the number of sheep it is possible to keep per acre has been increased approximately 60 per cent. on the plot that has been treated with 1 cwt. superphosphate per acre, and rather more where lime and superphosphate have been applied. Further, the sheep on the manured plots have shown a higher gain in live weight per head than have those on the unmanured area.



Group of Border Leicester Rams, 1 year old, bred at the Rutherglen Experiment Farm (Reg. Flock No. 97).

Sown-down Pasture.

Subterranean clover and Wimmera rye grass have been shown to increase greatly the carrying capacity of land on the Rutherglen Experiment Farm. Paddocks which are to be thrown out of cultivation for some years are very suitable for the sowing of these plants.

The following methods of etstablishing such a pasture have been tried in several fields, and various amounts of seed per acre have been used:—(*a*) By sowing subterranean clover and Wimmera rye grass with a cover crop of oats on well cultivated land in the autumn; (*b*) similar tests without a cover crop; (*c*) by sowing subterranean clover and Wimmera rye grass on the surface of stubble land following a cereal crop.

The recent dry winters have not been ideal for the establishment of sown-down pastures. Attacks of pea-mite also have proved troublesome. Satisfactory results, however, were obtained by the early sowing (April) of 2-3 lb. of subterranean clover and 4 lb. of Wimmera rye grass per acre in a cereal cover crop. When using this method, the stubble should not be grazed in the following autumn, and only lightly grazed in the next spring. In subsequent years, heavy grazing will not tend to thin out the pasture to any extent.

Top-dressing Subterranean Clover.

Experiments over some years have shown that well established paddocks of subterranean clover respond to top-dressing with superphosphate in a remarkable way. The quick response obtained, even in dry years, is particularly valuable for fattening lambs in the winter and early spring.

In order to measure accurately the increased growth obtained from the application of various amounts of superphosphate and lime to an old paddock of clover and other grasses, a comprehensive experiment has been carried out in No. 5 Field. The pasture is cut by means of a hand-mower as often as it reaches a grazing stage, the dry weight of produce weighed, and its feeding value obtained by chemical analysis. Additional plots have been mown at less frequent intervals as part of an investigation concerning grazing methods.

In addition to measuring the results obtained from fertilizers in the year of application, the residual effects for two years following without further top-dressings are being measured. It should thus be possible to determine the best quantities of manure to apply, and how often to apply them.

Results, 1929.

Such an experiment must run for some years before any definite conclusions can be reached. The year 1929 was very dry, but the following figures, which summarize the results obtained, are of interest.

Clover Top-dressing Tests, 1928,29.

Pasture mowed frequently, and dry weights measured. Botanical analyses showed it to be approximately 85 per cent. subterranean clover and 15 per cent. grasses.

Treatment.	Percentage Increase of Manured Pastures over Unmanured Pastures in 1929.	
	Immediate Effect. No Manure, 1928. Manured, 1929.	Residual Effect. Manured, 1928. No Manure, 1929.
Superphosphate, ½ cwt. per acre	36·7 per cent.	3·2 per cent.
Superphosphate, 1 cwt. per acre	51·6 per cent.	20·4 per cent.
Superphosphate, 1½ cwt. per acre	54·3 per cent.	22·6 per cent.

In 1929, 2.1 sheep per acre were comfortably carried on the balance of the paddock in which the above tests were conducted. This area, 24 acres, was top-dressed with 80 lb. superphosphate in April, 1929.

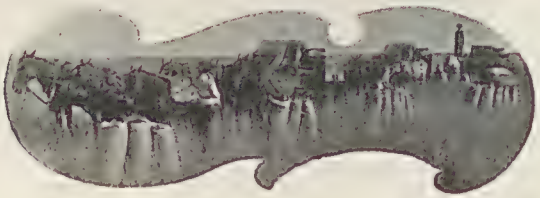
The carrying capacity of the various farm paddocks is being carefully recorded, as the profit to be derived from top-dressing depends largely on the number of sheep which can be carried per acre, and also the time of the year at which feed is available.

The chemical analyses have shown that the pasture from the top-dressed areas is considerably richer than that from the unmanured areas, but the complete figures are not yet available.

Improvement of Grasses and Clovers.

Efforts are being made to improve the feeding qualities of Wimmera rye grass. Many individual selections have been made, and one selection of superior type is now available in small quantities for trial by farmers.

It is known that there are many different strains of subterranean clover. Seed from many parts of Australia has been gathered and sown at Burnley, and the various types segregated. The most outstanding strains were sown at Rutherglen in No. 2 Field, and it is hoped that some of them will be especially suitable for the north-eastern conditions.



PASTURE HAY.

By R. T. McKenzie, Senior Dairy Supervisor.

The value of pasture hay as a winter fodder is becoming increasingly appreciated, and many farmers are making a regular practice of reserving a portion of their grass areas to be cut for hay.

Mr. J. Cumming, of "Flora Hill," Bendigo, is an enthusiastic advocate of meadow hay. The "Flora Hill" pastures are famous for the number of stock carried. An area of some 50 acres carries 65 head of cattle (mostly heavy-producing dairy cows) and 6 horses, yet Mr. Cumming is able to conserve some 70 or 80 tons of grass hay every year. Though some of these pastures have been down 30 years, they show no decline, and Mr. Cumming estimates that he gets 5 tons of hay to the acre. The soil, of course, is being continually rejuvenated by the application of farmyard manure. Owing to the density of the pasture, it has to be cut with scythes.

Harvesting.

Hay-making may appear simple, but there is plenty of room for skill in the work, particularly when the weather is not propitious. While the details of harvesting and stacking grass hay may vary slightly in parts of the State owing to a difference in climatic conditions and to a difference in the varieties of plants making up a pasture, in the main, the principles are similar. The desideratum is to get a maximum quantity of hay rich in digestible nutrients.

It is generally recognized that the period of maturity at which grasses are cut for hay largely influences the bulk of the crop, and also its palatability and its value as a food. It is, however, not so widely known that careful handling after cutting is just as necessary as is cutting at a particular time.

The crop should be cut when the bulk of the grasses of which it consists are coming into flower, that is, when the anthers or pollen sacs are thrusting between the chaff scales, for it is at this stage that the greatest amount of digestible nutrients will be obtained. If left beyond this stage, the nutrients are utilized to aid in maturing the seed—the riper the grass, the more rapidly are they used up by the developing seeds. As with other forage crops, weather conditions greatly govern the time of grass-hay-making. Therefore, the work should be carried out in such a way that, on the approach of bad weather, the material can be got together with a minimum of handling and the exposure of the least possible surface to rain.

The crop is usually cut with a mowing machine, or a scythe. Each swathe should be left until the following day, so as to permit of the evaporation of moisture, for it should be understood that, while freshly-cut grass may contain about 82 per cent. of water, grass hay should contain only about 18 per cent., and the superfluous moisture is got rid of by exposure to the sun and wind.

In the drier areas of the State, however, the crop may immediately be raked into small windrows. The next morning these are collected with a horse-rake into large windrows, and in the afternoon of the same day, may be run into cocks. When weather conditions are favorable,

the gathering of the crop into cocks may be dispensed with altogether, and the hay carted from the windrows to the stack, an arrangement that means a minimum of handling, and with good weather, the hay will be in the stack on the third or fourth day after cutting.

If rainy or unsettled weather intervenes, it means an extension of these operations, and necessitates a frequent turning and cocking of the hay during several days. It is under these conditions that some care is required to retain colour, palatibility, and the food value. The danger of the frequent turning is that the fine, delicate, waterproof coating of wax-like substance on the grass may get broken and allow the rainwater to wash out perhaps 10 per cent. of the soluble dry matter, which may contain 20 per cent. of the feeding value.

In such circumstances, it will be found advantageous to put the hay into small cocks; this permits it to be turned easily for drying purposes. The practice is sometimes followed in rainy weather of scattering the hay loosely over the paddock, but small cocks are preferable, for the reason that less surface is exposed to this washing influence of the rain. A fall of 100 points of rain represents about 100 tons of water per acre, and it is obvious that if the hay is scattered all over the ground, it is subjected to the washing influence of this large volume of water; but if it be put into cocks occupying only one-tenth of the area, it follows that only one-tenth of the crop is then touched by the rainfall.

Apart altogether from the rain washing out much of the soluble nutrients, it adversely affects the palatibility by removing that aromatic odour, and, further, destroys that pale-green colour characteristic of well-cured hay. Having in mind, therefore, the damaging effect of rain, an endeavour should be made to harvest in fine weather, even if it means an early cutting, or, in other circumstances, a late cutting. In this connexion, it might be pointed out that, while early cutting may mean a loss in weight, it is offset to some extent by the increased aftermath growth. Though late cutting means a more fibrous crop, and one requiring more delicate handling, it is better than the crop cut just at the right time but damaged by rain subsequently.

Harvesting Clovers.

In making hay from pasture consisting solely of clovers, much more gentle handling is required to prevent damage to the fine leaf. This crop can be left in the swathe for a day or two to allow the exposed surface to dry sufficiently; it should then be carefully turned to allow the nether side to dry. When this is accomplished, the swathes are gently put into windrows, and thence carted directly into the stack, cocking being avoided if possible.

Stacking.

In stacking, the object is to exclude as much air as possible, and this is secured by spreading the hay evenly, and by trampling, so that fermentation will be kept within bounds. If the stack is properly consolidated in this way, the hay will develop an agreeable aromatic odour, and there will be no sign of mildew. If the material is too green or damp when stacked, heat generates to such an extent as to produce charring. This lessens palatibilty of the hay, and is also likely to cause serious digestive derangements in the stock eating it.

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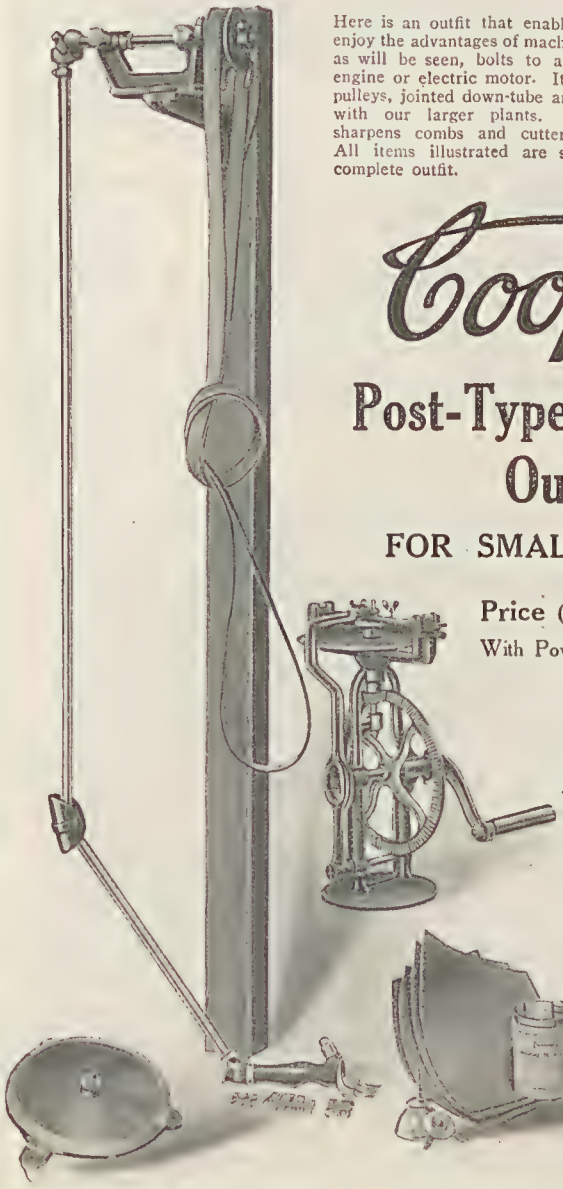

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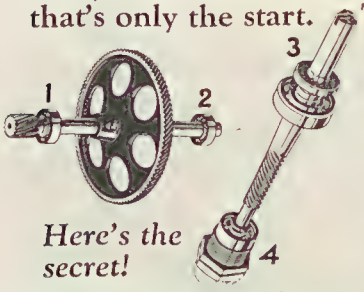

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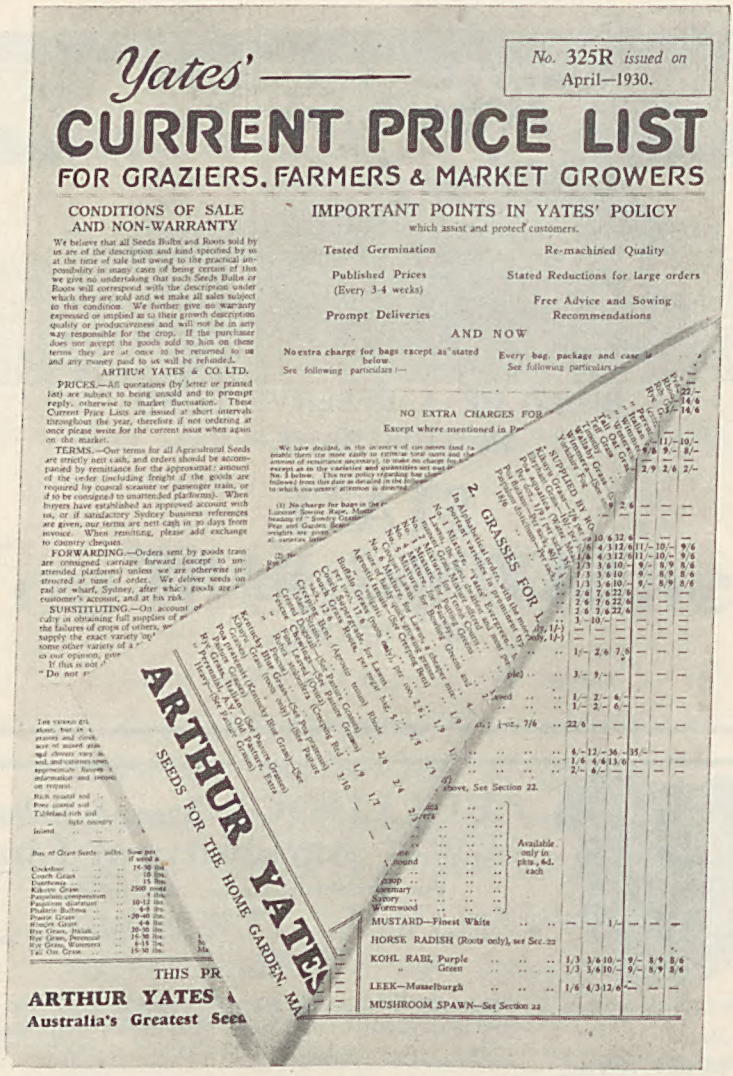

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